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[OFFICIAL NOTICE.]

Notice of the Sixth Annual Meeting of the Western Gas Association.

The Sixth Annual Meeting of the Association will be held at Cincinnati, Ohio, on the 9th, 10th and 11th days of May. Due notice of the action of the Committee of Arrangements will be given in a subsequent issue of this JOURNAL.

Members intending to present papers will confer a favor upon the Secretary by forwarding to his address at as early a date as possible the titles of their articles.

Sincere pleasure is taken in stating that the outlook for a profitable and largely attended meeting is exceedingly favorable, and the best of reasons exists for the belief that this expectation will be fully realized.

A. W. LITTLETON, Secretary.

GAS MANAGERS ASSOCIATIONS AND THEIR RESPONSIBILITIES.

When allusion was made in these columns to the inaugural address of the President of the New England Association being an excellent exemplification of the practical nature of the speaker, we had particularly in mind one or two sentences of the speech. As an instance, take the questions, "What are we organized for? Why are we here to-day?" They show on their face the desire of the presiding officer to bring his listeners down to the practical work of the Association. If any doubt is entertained of the correctness of our deductions on this score we can turn to the remarks relative to the semi-annual meetings, which will tend to bear us out in this particular.

Naturally, then, the question arises: What is the proper work of an association of gas managers? We do not refer to the New England convention especially; but put the inquiry generally, to include all the societies of gas engineers scattered throughout the country. Let us seek the answer to the query in the constitution of the American Gas Light Association, where we read, in article 2, "The objects of this Association shall be—the promotion and advancement of knowledge, scientific and practical, in all matters relating to the construction and management of gas works, and the manufacture, distribution, and consumption of illuminating gas, to the end that its cost may be cheapened and its consumption increased. The establishment and maintenance of a spirit of fraternity between the members of the Association, by social intercourse, and by friendly exchange of information and ideas on the before mentioned subject matters."

The remaining section of this article of the constitution bears on the relation between the gas manufacturer and the consumer. We may confine ourselves, for the present, to the first two clauses.

And may we be pardoned for putting the pertinent question: What have our associations, singly or combined, done this last year toward the advancement of knowledge relating to gas matters?

The answer will come that they have done much; that though no very abstruse papers have been read at any of the conventions during the last twelve months, nevertheless much information has been given, and received by the members at these gatherings. And doubtless the reply will be supplemented with the remark that more good comes to the members from their semi-social semi-private chats, than the members of similar organizations in foreign lands devise from weighty papers which are read at their meetings.

Let us admit the truthfulness of the answer. Let us grant that the rule which seems to hold in some of the Continental gatherings of gas managers, that a paper to be worthy of their consideration must bristle with recondite matters put in a complete form, is one which should be studiously avoided. We will even go farther and say, with all candor, that we would rather, infinitely rather, have our Association meetings partake of the nature of a gathering of practical men discussing, in a social, manner matters connected with their business than that there should be any foundation for the stricture that the meetings are only of interest to the professional engineer. Nevertheless, we say, in the face of the admissions, and with equal candor, no such progress has been made, the last year, in the advancement of knowledge relating to our business, as should have been made. For we hold strongly to the opinion that every year should see some one of the disputed questions of gas polity investigated so thoroughly and systematically that the conclusions to which the research leads may be final for a long time to come. The truth is, that only the second clause of the article of the constitution quoted

has been lived up to. And possibly it has escaped many of our readers that the two clauses are not a repetition, one of the other, but they refer to two distinct methods for disseminating knowledge of special interest to gas men. And it is the first section which should in the future receive more attention.

As illustrative of the advantages which would flow from systematic work on the part of our associations, let us turn to the coke question. Would we greatly err if we were to say that one-fifth of the time of the various meetings of the year or two passed has been taken up with the consideration of the yield of coke per ton of coal, and tho side issues involved in its consideration? And would we err if we were to say that we are not much wiser in this particular now than we were twenty-four months ago? Nor have we far to seek for an explanation of the unproductiveness of these discussions; for it is clear that experiments of such a nature as the yield of coke per ton of coal, made independently by different members, under varying circumstances, must lead to conflicting results. Thus, one investigator will have the coke measured and weighed hot, another will first have it drenched with water, while yet another will see that only sufficient water is thrown on it to blacken the top layer of the coke. One will use a bushel basket, another a measure of ten-fold greater capacity, while in another instance a three-bushel measure will be made use of. Yet, again, one gentleman will base his deductions on results reached by using a measure holding ten heaped bushels, while another will employ a measure equal to ten stricken bushels and then heap the large gauge. Then, again, there are differences in the coal, and in the percentage of cannel used. Thus it is clear that it is well nigh impossible to take these independent experiments and draw therefrom any safe conclusions. But what a different aspect this matter would assume if it were referred to a committee of one of our associations, who would readily draw up a plan of operations which all could follow, stipulating the conditions under which the experiments were to be conducted, the size and shape of the measure to be employed, and other particulars. Then a conclusion would be reached which could be accepted as well nigh conclusive. And the time of our meetings could be more profitably employed. We mention the coke question, not because it is one of absorbing interest, but give it prominence as a handy illustration of the good results which would flow from a little systematic committee work. Again, how conflicting are the data relative to the amounts of gas purified per bushel of lime, and how easy it would be for a committee to bring order out of this chaos, so that the results obtained by the several managers would be easily compared. Take another case; the returns in regard to street leakage are always meaningless; but if a few members of one of our associations were to take hold of the subject some plan would be evolved, whereby the comparative loss of the several companies could be considered.

But the objection will be raised that the American gas manager is so busy that no one would have the time to devote to such committee work. We deny the statement in the most emphatic manner. The work we have so far outlined would take so little time that we doubt not anyone would be willing and ready to do his share. When we come to more recondite matters, as the scientific investigation of some vexed question, wherein careful and elaborate experiments are necessary in order to arrive at conclusive results, then we will admit that a greater demand would be made upon the time of some one or two members than could be reasonably asked of anybody. In such a case, why could not a scientist be employed to make such experiments, leaving only for the committee the mapping out of the work? The treasuries of the majority of the societies whould be equal to the emergency.

Thus we have outlined briefly how we think the tenor of the first section of the second article of the constitution of the American Gas Light Association would be more thoroughly lived up to. We would not for a moment detract from the value of the social features of these various meetings. We appreciate full well—none better—that great good comes from these conversational meetings, especially to the younger members of the profession; but what we plead for is that there be some systematic work combined therewith. Let the managers of our associations see to it that there are provided for every meeting a limited number of good papers—we do not stipulate for abstruse dissertations—and some conclusive committee work. After these have received attention, there will be ample opportunity for the social part of the programme. By such a plan we would combine the strong points of foreign associations with the good of our own. And as each succeeding year rolls by, one would see something accomplished, something done to earn a just repute.

The Western meeting is the next on the list. Will they not set their brethren an example in this matter?

CONSOLIDATION IN BROOKLYN.

The Fulton Municipal Company has not yet succeeded in absorbing the works of the Nassau Gas Light company into its system; the management of the Nassau Gas Light Company is still intact.

Street Lighting in San Francisco, Cal.

San Francisco (Cal.) is in a bad way financially. In our issue of March 2 we gave a short account of the action taken by the Board of Supervisors in reference to the curtailing of the number of street lamps in order that the amount of money available for street lighting purposes might not be exceeded. The action referred to was taken on the 6th of February. It will be remembered that it was decided to cut the number of lamps down from 5,438 to 3,000. This scheme was carried out for a short while; but on February 26, the august supervisorial body determined that further retrenchment was necessary, and a resolution was passed ordering the entire discontinuance of the use of gas in the city's lamps. Since the passage of this order San Francisco has been in the dark, as to her streets, and in the night time a state of the greatest confusion exists; lawlessness is rampant, and the thieves are holding high carnival. The San Francisco *Chronicle* presents the following interesting picture:

"William F. Hale was found dead a few mornings ago in the cut at the crossing of First and Bryant streets. The Coroner's jury found that he came to his death from a fall down the bluff and that the accident would not have occurred had the usual street lamp kept there not been discontinued by order of the Board of Supervisors. Two highway robbers were arrested on the night of the 7th inst. by Policemen Coffey, Jones and Meagher, but they were enabled to escape through the cimmerian darkness of the streets and will, with scores of their kind, be actively plying their vocation again tonight and as long as the darkness continues. Moreover, this extinguishment of the street lights is a direct bid for re-enforcements of thieves, robbers, and burglars from the country and from Eastern cities, where their chances are less favored than here. And such accidents as caused the death of Hale may be looked for as very frequent occurrences. Either the gas company or the city ought to be liable in damages for these, since they result directly from the acts of one or the other, or both."

No only has the gas been turned off from the public lamps, but the Police and Fire Departments have been put on short allowance. The Fire Department is so illy provided for that a short time ago it was thought it might be necessary to turn the engine horses out to pasture for want of food for them. Extravagance has bred its attendant evils, and the political hangers-on of course fight against curtailment in the proper quarters. With a tax rate of 2½ per cent. for city alimony proper, which yields nearly $3,350,000 for the government of a compact city of 240,000 inhabitants, the streets are in darkness and public matters are going to wreck generally.

Is it Economy to do So?

The management of the elevated railroads of New York City has instituted a series of experiments with a view to employing kerosene instead of gas for the lighting of the stations and platforms.

Two stations on the Sixth avenue line, one at Fiftieth street and the other at Fifty-third street, have been supplied with lamps and the officers are watching the effect of the change. The Manhattan Railway Company had a three years' contract with the Metropolitan, the Harlem and Manhattan gas companies to supply the stations with gas at $1.25 per thousand. This contract expired last October, when the price was raised to $2.25. Last year the gas account of the company amounted to $43,220. The advance in the price in gas would make the account this year $66,593. The directors of the elevated roads should bear in mind the experience gained by the management of the Philadelphia and Reading Railroad elsewhere noted. It would more than likely be somewhat cheaper to burn gas than bear the expense of rebuilding one or two stations after they had been destroyed by fire.

Another Naphtha Fire.

The storage building of the Automatic Lighting Company, on Elizabeth avenue, opposite the City Hall, Elizabeth, N. J., was destroyed by fire on the afternoon of Sunday, March 25. The material used in manufacturing the light which the company supplies to the city is naphtha, and the building burned with such rapidity that much consternation ensued. Luckily the flames were prevented from extending to the neighboring structures. Two hose-carriages were caught so near the flames that they had to be abandoned, and one of them was destroyed. The loss occasioned will exceed $10,000. The fire did not interfere with the lighting of the city.

FACTS IN HYDRAULICS.—The capacity of pipes is as the square of their diameters, if you double the diameter of a pipe you increase its capacity four times. A cubic foot of water weighs 62½ pounds, and contains 1,728 cubic inches, or seven and one-half gallons. Each nominal horse power of boilers requires one cubic foot of water per hour. The ordinary speed to run a pump is one hundred feet of piston per minute.

The Management of Small Gas Works.

By C. J. Russell Humphreys.

[Continued from page 124.]

We are very willing to admit that in the design of our retort house we have shown a somewhat larger building than it is customary to erect for a like number of retorts. We, however, had our reasons for fixing on the dimensions stated. It has already been noted why we want the extra width in the structure; it only remains to be said that the 10½ ft. space at the end of the stack will be utilized for a tar scrubber. We hold firmly to the opinion that a gas works is not complete without an apparatus for removing tar by means of friction; and, further, that the position for such a machine is next to the hydraulic main, because it is very necessary to have the gas pass through it hot. To give room for this apparatus, as well as afford space for the boiler, was our main reason for making the house as long as we did.

The zig-zag scrubber, two compartments, 3 ft. by 2 ft. in cross section, by 18 ft. in height, will answer our immediate necessities, but we will so plan the connections as to admit of more sections being added as they may be required. The apparatus will be surrounded by a sheathing of 4 by 8; the intervening space of one foot all around will be filled in with mineral wool, while the connecting pipe from the hydraulic main will be covered with asbestos felting. We will, of course, provide inlet and outlet valves and bye-pass.

It may be as well to state here that the connections throughout the works will be 8 in. in diameter and the valves will be of the pattern having an outside thread, which is the preferable style where there is any tar or other residuum.

The condensers (so called) are now entitled to attention. From our parenthetical remark it will be seen that we object to their usual appellation; let us say that we think the correct term for this part of our plant is the "cooler." Friction, not refrigeration, is the proper agency to employ in removing the tar; and as for the gas, we wish to cool, not condense, it. If these points be kept in view, no harm can come of our using the common titles for them, and we might be deemed pedantic if we insisted on giving them a new name. We will employ what is generally known as the multi-tubular condenser, but we cannot reconcile ourselves to the plan on which they are often constructed; we refer to the arrangement where two of these apparatuses are in use, but each one so divided as to form two machines. Thus, if each of the two condensers contained 18 three-inch pipes, the gas would pass up nine of them, down the remaining nine, and then perform a similar circuit through the second one. By this unique plan the gas is alternately in contact with cold and hot pipes, and vice versa.

We will erect two condensers, 3 ft. in diameter and 12 ft. high, each to contain 18 three-inch tubes. We will so arrange the connecting pipes that the gas, as it comes from the zig-zag, will be free to go through either of the two coolers (we doubt not that it will be equally distributed between the two); and so the one passage will suffice to bring down the temperature to the desired point—say 60° F. Each apparatus will be provided with inlet and outlet valves, so we will be free to use only one machine in cold weather if we so desire.

The record of either the Root or Mackenzie exhauster is such that we can adopt either with perfect confidence. The capacity of the machine will be two-thirds of a foot per revolution. The combined exhauster and engine are often recommended as being particularly suited to small works. Frankly speaking, we hold a contrary opinion. We must concede that such a combination makes a very compact arrangement; but, as the exhauster and engine are connected directly, it is necessary that the two machines make an equal number of revolutions per minute, and as the former would move at a very low speed in the summer season, the engine would be going so slowly that it would be apt to stop on the center. As an illustration, in our imaginary works, during the period of minimum consumption, the exhauster would make only 24 revolutions per minute; it is therefore manifest that if we attempt to check the engine down to the same speed it would come to a halt on the center, or, at the best, run with great irregularity. We will therefore use a 3-horse power engine, on a separate bed plate. Our preference is for the horizontal type. The two machines will be connected by belting with an overhead shaft. We will have two driving pulleys for the engine, one for the time of heavy gas consumption, the other for the summer season. The relative circumference of the two wheels will be as 2 to 1. To facilitate our making the change from one to the other, we will have a section of the driving belt corresponding with the difference in the pulleys, so fixed that it can be quickly laced in or taken out.

The exhauster will be fitted with a Smith & Sayre compensator. For controlling the speed of the machine we will use either the governor made by the same firm, or one of the American Meter Company's make, or possibly the Huntoon pattern. Any of these will work well, and it is therefore unnecessary to state our preference. In any case we will be particular to have the throttle valve close to the steam chest of the engine, as well as to have the valve and the governor in close juxtaposition. Equal care will be exercised to have the connecting levers work with perfect freedom and simultaneously, without any lost motion. Nor will we be any the less careful in avoiding in the governor mechanism all thin rods, such as would, on account of their flexibility, have a constant tendency to spring. This is but another form of lost motion.

All the connecting pipes for the exhauster, condensers, etc., will be, as far as possible, on the ground floor, while the machines themselves will be on the upper level.

No syphon pots or water lutes will be placed either in the engine room or the cellar beneath. A partition wall will be erected on both floors, dividing the engine room and basement from the scrubber section. With this precaution we will be free to use a light in the engine room, and be enabled to exclude from it the ammoniacal vapors which would have been prevalent here had we combined the scrubber room with the necessary drip pots, and the engine room.

The scrubber will be built on the tower principle, with a diameter of 3 ft. and a height of 18 ft. The filling will be of wooden lattice work, and so arranged that open spaces and the solid portions of the trays will alternate. The pressure of the water will be made to work its own distributing mechanism.

The purifiers, four in number, will be 6 ft. 3 in. by 8 ft., and will be worked by a dry center valve. The lutes will be 10 in. deep. According to most rules these purifiers would be large enough for a make of 80,000 feet a day; we think nothing will be lost by having them large—on the contrary, we will get more work out of a given quantity of lime. Another advantage accruing from their large area is that, as the purifiers will not have to be turned on very often, they can be prepared during odd moments. Again we will have to diverge from the common practice by refusing to adopt the fossilized plan of using five thin layers of lime in each purifier; two lines of trays will be more efficient, as well as more economical. The aisles through the center of the purifying room will be 6 ft. wide, and door from the lime room will be in the middle of the width of the building. We will have a chute from the purifier house to the level below, so that the refuse lime can be thrown directly into the barrow or car on the lower floor. An incline roadway will be built at the end of the lime shed, in order that this material may be carted directly into the building.

The capacity of the station meter will be 5,000 feet per hour. We will not attach to it a syphon overflow at the water line, but content ourselves with having a very plain marker for showing the true level. We will see that the cock on the water supply pipe is in a handy position; thus there will be no excuse for allowing the water line to vary from the correct mark. Meter makers have such a tender regard for their goods that they are usually satisfied with marking the water line on station meters by a row of faint center-punch marks, which are almost obliterated by a coat of paint; consequently it is a matter of a few moments to determine whether or no the water in the gauge is at the correct point. We prefer a marker attached to the case of the meter, and extending out to the glass.

In our plan we have stipulated for a holder house, because we think, in a small works, it is very necessary that such a structure should be covered in, and be safe from the effects of heavy storms. Any gas engineer will admit that it is not a pleasant task to ascend a gasholder in the face of a gale of wind and clear it of snow. It must also be granted that, if the work has to be done during the night, when perhaps there is only one man on duty, the luckless individual who has to perform the task is not to be envied.

We will have scales attached to the holder, both inside and outside the building, so that the amount of gas on hand may be readily ascertained.

Our street governor will be made on the Hunt principle, which is the most inexpensive and simple regulator with which we are acquainted.

By building the the meter and governor houses adjoining, we will be enabled to have all the holder valves together. A direct connection, with its proper valve, will be made at this point between the street supply pipe and the meter outlet, permitting gas to be sent direct to the main in case of accident to the holder.

[To be continued.]

An Excellent Showing.

The Williamsburgh Gas Light Company, Brooklyn, N. Y., received four thousand dollars more last year for their ammoniacal liquor than in any previous year. This is due entirely to Mr. J. R. Thomas's intelligent manipulation of the "Standard" washer-scrubber. Ten gallons of clean water per ton of coal were used. Good as this result is, Mr. Thomas proposes to beat it during the coming year. He has concluded a contract with a well-known firm who agree to take all the liquor made and pay for it at the rate of 27½ cents per ton of coal carbonized.

[Official Report.—Continued from page 128.]

Thirteenth Annual Meeting of the New England Association of Gas Engineers.

Held at Young's Hotel, Boston, Mass., Feb. 21 and 22, 1883.

Afternoon Session—Feb. 21.

Mr. F. C. Sherman then read the following paper on

steam heating vs. gas heating.

My paper is a brief review of evidence taken under a petition addressed to the Connecticut Legislature on behalf of the Hartford Steam Heating Company to evolute into a gas company.

The Hartford Steam Company, organized under the laws of Connecticut to distribute steam for heating and mechanical purposes, applied to the Legislature now in session to have their charter amended so as to allow them to distribute gas for these same purposes. At a hearing before a Committee of the Legislature, the petitioners stated that they had 2½ miles of mains laid in the streets of Hartford, had 20 boilers in position for use, and were consuming under these boilers 40 tons of coal daily. They claimed that by converting their coal into gas, through some of the water gas processes now before the public, they could send out the same amount of heat with one half the coal they were at present using, but no evidence was introduced to show that this could really be done. The petitioners did not name the process they proposed to use, nor the kind of gas they proposed to distribute, simply specifying "gas for heating and mechanical purposes."

They did not state the price at which they proposed to sell their gas, only that they could make it such as to compete with coal where it is used in large quantities for making steam. In regard to the profits of selling steam for power and for heating, by sending it around in pipes to the customers places of business or residence, about which so much was said some three years ago, and which we were assured would be 100 per cent. per annum, they said their expectations had not been realized. There had been no profit; on the contrary they had lost money in the business.

They showed the Committee a plan and description of Springer's process, which has just been introduced into the Elgin Watch Company's Works, at Elgin, Ill. This Springer patent is a cupola process by which, it is claimed, one ton of coal can be made to produce from 70,000 to 100,000 feet of water gas; but, as this process had been in operation only one week, not much account was made of it as evidence. It was claimed that with coal at $4.00 per ton, gas could be produced by this process for four cents per 1,000 feet, and that it could be carburetted sufficiently to give it an odor for two cents a 1,000, although they did not admit that it was necessary to give it an odor.

They claimed that only 20 per cent. of the heat units in coal could be utilized in the best arranged apparatus yet known for its combustion, but that in the use of gaseous fuel 80 per cent. of the heat units could be made available.

They proposed to introduce their gas into dwelling houses for heating and cooking purposes, and in fact into every place where either heat or power may be needed. They stated that by carburetting the gas on the premises where it was to be used it could be successfully employed as an illuminating gas, and could furnish light very much cheaper than could be done with ordinary coal gas. They claimed that gas is to be the fuel for the future.

Remonstrances against this petition were made by the Hartford Gas Light Company, by the owners of real estate adjoining the proposed location of the new gas works, and by the City Attorney on behalf of the Board of Street Commissioners, who protested against the tearing up of the streets.

The Gas Light Company claimed that they had mains in the streets in the territory which the amended charter proposed that the Steam Heating Company should occupy; that they were now furnishing gas for heating, for fuel, and for mechanical purposes; that the amount of gas thus used was very limited; that gas for fuel and for power could be used profitably only where its use was intermittent, and that for steady use it could not compete with coal.

They claimed also that there had been a constant decrease in the price charged for gas ever since they commenced the business, in 1849; that there were no petitions for this charter outside of the Steam Heating Company; and that it would be impossible to draw up the proposed amendment to the charter in any way that would not make the Steam Heating Company an opposition gas company and a competitor to them in the sale of illuminating gas.

The Hartford Gas Light Company further claimed that water gas used as fuel could not be produced at such a price as to compete with coal, and in proof of this they cited the Municipal Gas Light Company of New York. This company claims to put water gas into their holders for ten cents per 1,000 cubic feet. Some three years ago they tried the experiment of using this water gas for heating their retorts, but presently abandoned the use of it because they found it to their advantage to continue to buy coke for this purpose; in other words the water gas, at their own cost of production, could not compete with coke for heating.

In this connection I will add that Mr. E. Vanderpool has experimented with water gas and with coal gas for heating purposes and has very kindly given the gas fraternity the results of his experiments. In this paper Mr. Vanderpool says, that to compete with coal at $6.00 per ton, coal gas must be sold at 31 cents per 1,000 cubic feet, and water gas at 15½ cents per 1,000. He says further, "It was found that 1 cubic foot of ordinary coal gas would rather more than do the work of 2 feet of water gas, both gases being used under identical conditions." Speaking of the heat required to produce water gas, he says, "If we look at the heat required in the manufacture of water gas to produce the decomposition, etc., giving the benefit of an extremely favorable estimate, we find that the gas will yield but a little more than half as many units of heat as are required for its production. Assuming that it is possible to produce 1,000 cubic feet of water gas with a consumption of 50 pounds of carbon, we have in the carbon 645,300 units of heat, and in the water gas 341,000, showing an absolute loss of 304,300 units, or nearly one-half of the energy of the fuel, so that it takes nearly twice (and from the data generally accepted not less than four times) as much heat to make water gas, as the gas will yield when consumed."

The Hartford Gas Light Company rightly claimed that what the Steam Heating Company proposed to do was an untried experiment, no evidence showing that water gas was ever distributed on a commercial scale for fuel and for heating and mechanical purposes, and that the amendment to their charter would be worthless, except as it allowed them to distribute gas for illumination.

They also called the attention of the Committee to the extremely poisonous nature of the gas which the Steam Heating Company proposed to distribute in the homes and shops of their customers; such gas containing 40 per cent. of carbonic oxide. The London *Journal of Gas Lighting*, vol. 5, p. 336, speaking of water gas, says, "It is composed of hydrogen, carbonic oxide, and carbonic acid. The hydrogen and carbonic acid produce no poisonous action on the animal economy, but the carbonic oxide is one of the most poisonous gases known. A very small portion of carbonic oxide mixed with the air of a room is sufficient to kill all the persons who are in it; and as this gas is totally devoid of smell its presence cannot be perceived. It is produced by the imperfect combustion of carbon; and it is this gas which causes the death of persons who commit suicide by charcoal fumes. Death is occasioned in those cases by real poisoning. It is on account of the eminently poisonous properties of carbonic oxide which always forms a large proportion of the gas made from water, and which cannot be absorbed by any practical means yet known, that the water gas was rejected in a positive manner by the Municipal Commission of Paris."

It was shown that where this gas was given an odor by carburetting it for illuminating purposes, and the carbonic oxide reduced to 26 per cent. of the volume, it was still very dangerous. Statistics were given, showing that since 1878 83 deaths or poisoning accidents, some of the latter proving fatal, have been caused directly by the inhalation of illuminating water gas in New York and Brooklyn, and that notwithstanding the fact that from four to five times more coal gas had been sold in the two cities than water gas, but one death from illuminating coal gas had occurred, this being a suicide who inhaled the gas for 36 hours in a small room, the crevices and key-hole of which he had stuffed with paper.

It could have been added that the history of water gas in our own State confirms its poisonous record. Since its introduction by the Middletown Gas Light Company three persons have been killed in that place by inhaling this gas, within the last three years. This company may have five hundred consumers.

Since the introduction of illuminating coal gas into this State, in 1848, in the cities of Hartford, New Haven and Bridgeport, and numerous other smaller places, there is no record of a single death caused by its inhalation.

The waste of energy caused in its production, and the poisonous nature of the article when produced, are two items so inseparably associated for the present with water gas, that they stand as strong arguments against its introduction anywhere as a substitue for coal gas.

Before the Committee the City Attorney protested against tearing up the streets for that which the petitioners themselves confessed was an experiment. He said that they had left the streets in which they had laid their steam pipes in a very bad condition, and that by their constant breaking up of the streets for repairs of their pipes they had made a nuisance. He thought it would be better to try the experiment in some other place than in Hartford. He would not oppose the introduction of any tried improvement into their city, but wanted no more experimenting in their streets.

Discussion.

The President—Are there any remarks to be made upon Mr. Sherman's paper?

Mr. Cabot—I move the thanks of the Association be extended to Mr. Sherman for his very interesting paper.

The Secretary—It seems to me that we shall cut off discussion by passing a vote of thanks at this time. It is usual to pass such a resolution after the discussion has closed. The company with which I am connected proposes to introduce gas for heating and cooking purposes; but Mr. Sherman's paper rather discourages it.

Mr. Sherman—We have a visitor here from Auburn, N. Y., who tells me that he has been experimenting with coal gas for heating his own house, and finds that 7,000 feet of coal gas is only equal to 200 pounds of coal, which, at the price he pays for coal in that place, would require the gas to be furnishen at seven cents per thousand for heating purposes.

Mr. Cabot—I did not desire to cut off debate on this subject by offering my resolution of thanks. I thought it a subject on which there was not likely to be much discussion.

The President—The Association would like to hear from Mr. Dunning, of Auburn, if he is present.

Mr. Dunning—The experiment referred to by Mr. Sherman was tried by me four or five years ago. At that time it rather looked to the Gas Light Company as if it might soon become desirable to utilize its property for some other purpose, than the making of gas for illumination. I was then fitting up my house for heating by steam, and thought I would see what could be done by using gas for fuel. I corresponded with the Providence Retort Gas Stove Company, told them what I wanted, gave them the dimensions of my boiler, and they sent me seven burners, and recommended them as being equal to the heating of my house. These burners had a capacity of from 10 to 20 feet per hour, as the pressure might vary from 1 to 2 inches. After placing them under the boiler and starting up, I found that it was impossible to get up sufficient steam pressure, and I wrote on for more burners. They sent me six more, and I experimented with them in various positions, and finally managed to get up sufficient heat to produce the steam to warm my house. It was with the result stated by Mr. Sherman, that it required 7,000 feet of gas to take the place of 200 pounds of coal. I experimented alternately, one week with coal and the next week with gas. The average result was about the figures that have been given.

The Secretary—In speaking aside to Mr. Sherman, I told him that I thought he rather discouraged the use of gas stoves. "No," said he, "I do not. I have one in my own house." From what has been said, and from the figures presented, one would be apt to conclude it was far from economical to use illuminating gas for heating or cooking; yet I think the experience of many of us will show that it can be economically used for both purposes.

The President—I think you got a wrong impression from Mr. Sherman's paper. I understood him to say that it was unprofitable to use water gas for heating purposes.

The Secretary—No; he referred to coal gas.

Mr. Todd—I would like to ask Mr. Dunning if the boiler used by him was an iron boiler, or a copper boiler especially adapted for the purpose.

Mr. Dunning—The boiler was an ordinary one, such as those used for heating by steam. After I began the use of gas I put in a grate, and have since been heating my house with coal. I think, perhaps, I should have had better results if the boiler had had copper flues. We found great difficulty in avoiding the odor, which seemed to pass all through the house, and which probably arose from the gas not being properly consumed. It was necessary, in order to carry off the odor, to have every draft open between the boiler and the chimney. Consequently a large part of the heat would pass up the chimney. Yet it was necessary to do this, and to waste the heat, in order to keep the disagreeable odor from filling the house. I experimented by placing the burners in various positions; yet the result was as I have stated. It did not seem possible to get heat enough to generate steam sufficient to warm the house continuously for twenty-four hours without a great waste of gas, and an expense altogether out of comparison with the expense attending the use of coal.

Mr. Taber—From what experience and information I have, I am led to agree with the conclusion drawn by Mr. Sherman, as stated in his paper—that, as a fuel for heating large surfaces or spaces, gas is not the most economical fuel that can be used. I do not think it can be introduced for house-heating except under very heavy expensive conditions. We are all aware of the relative cost of steam and gas engines. We can highly recommend the gas engine for intermittent use, for low powers, just as we can recommend the gas stove for small spaces; but I have never seen it applied in large spaces to any advantage whatever. I made an experiment last summer, in trying to heat an ordinary water-back with gas; and I found that, even with copper tubes, it was impossible to do so without an expenditure of four or five times as much for fuel as would have been required by the use of coal. The amount of gas that went through that stove was really astonishing. And yet for a small cooking stove or heater gas may be used economically. There is a limit to the use of gas for heating. I never yet found a gas stove that would satisfactorily heat an office of any dimensions. For small spaces gas can be used to advantage; and some, to whom we have recommended it, have been entirely satisfied with the result; but for heating large spaces I think gas companies should be very careful how they recommend heating by gas, as it will not prove satisfactory.

Mr. Allyn—I think that the President has had some experience in the use of gas for fuel. Does he consider it economical?

The President—It is economical to a certain extent. I have had the same experience as Mr. Taber, having used it to take the place of the water-back. I have found that in a furnace we burned a great deal more gas than was really necessary. I found that very often the burners that heat the water, or the boiler, were left going all night. That was one disadvantage. Otherwise it was economical, and would do the work very nicely.

Mr. Todd—Reference has been made to the cost of running a gas engine continuously. A gentleman connected with my company spoke to me about getting a gas engine; and I sent to Boston for an estimate of the cost of running a gas engine ten hours per day. The information furnished in reply was to the effect that the gas would cost twenty cents per horse power for ten hours, with gas at $2.00 per 1,000 feet. I do not think a steam engine can be run any cheaper than that.

Mr. Fette—I have been investigating somewhat the subject of gas engines. I went to the store at 229 Franklin street, to see a seven-horse power engine which was there running two large elevators for ten hours per day. I asked the man who was operating it some questions, but he replied that he was no mechanic, and knew nothing about engines. "But," said I, "you run this engine?" He replied, "I do; and have been running it for a year." They were thus saving the expense of an engineer. I then saw one of the members of the firm, and asked him the disadvantages connected with the use of the gas engine. He said that there were none. I asked him what it cost him. He said they had run it for two years, and that at the present price of gas in Boston it cost them $1.25 per day for gas and water to run the seven-horse power engine.

Mr. Taber—I would not have it understood that I in any way deprecate the use of the gas engine. I think gas can be economically used for small powers; but for large powers, or for heating large spaces, I think we should be very careful how we recommend gas.

The President—The discussion on this paper seems to be taking rather a wide range. If there is no objection, we will now proceed to the reading of the next paper.

Mr. Nettleton—Before the next paper is read I would like to take up the discussion on a subject suggested by Mr. Sherman's paper, that of carbonic oxide. I was at the Pittsburgh meeting, and was not satisfied with the way that the subject was handled there. It seems to me that the main point of Mr. Sherman's paper is that here is another method by which these water gas men are going to push their business. I think the great argument which should be used against the introduction of water gas, is the poisonous nature of the gas. It seems to me that this has been very effectually proven by the experience in New York and Brooklyn. Water gas has been supplied in the former city since about 1870, there occurred during that time nearly one hundred deaths in both cities. It is understood and believed by coal gas people that all these deaths, with a single exception, have occurred in buildings furnished with gas supplied by water gas companies. I believe that gas has been sold in New York for fifty years, and until water gas was introduced, there was not on record in the Coroner's office a single case of death by the inhalation of gas; and since that time there has been only one case of a death from gas in a building in which coal gas was sold. As Mr. Sherman has told you, there was never a death in Connecticut from the inhalation of gas, prior to the introduction of water gas. Since that time, only three years ago, there have been three deaths, and those have occurred in a city in which, when they changed from coal gas to water gas, they sold less than 10,000,000 feet. If deaths had occurred at the same rate, and in the same proportion to quantity sold during the time in which gas has been sold in that State, the death list would include over three hundred names. It seems to me there can be but one deduction from these facts: That there is a difference in the effects between inhaling coal gas and water gas, and that water gas is more injurious. The fact that water gas has occasioned so many deaths is to me convincing proof that it is a highly dangerous poison. I feel so strongly on this subject that, if I had to take my choice between making water gas and leaving the business, I should go out of the business, and that at once. I could not excuse myself, as did a gentleman at the Pittsburgh meeting, who is engaged in supplying water gas, by saying that his company was in no way responsible for deaths occasioned by parties leaving the gas turned on in their rooms; that the deaths were merely the result of carelessness on the part o parties using the gas. It is true that they resulted from carelessness, but judging by experience where coal gas is sold, if his company had supplied coal gas, instead of water gas, so many deaths would not have occurred in his city. Legislatures throughout the country enact laws to the effect that poisonous drugs should be labeled as "poison," and labeled in such a way that "He who runs may read." Suppose that water gas companies were compelled to label the gas which they supply,

"This is a poison." How much of it could they sell? Would it be otherwise than right to require this to be done? Do not the number of deaths that have occurred in New York, and elsewhere, prove that this water gas is a most violent poison? I do not care whether water gas costs half as much as coal gas. The only question for us to determine is whether it is safe for the public to use it; and if we do not believe it safe have we, as gas manufacturers, a right to supply it?

Mr. Sherman—I have to correct the gentlemen as to one statement. He said that water gas was introduced into New York in 1870. It was not introduced there until 1878.

The President—If there are no other remarks on this subject, we will listen to the reading of the next paper, by Mr. Horace A. Allyn, on the "Yield of Coke per Ton of Coal."

Mr. Allyn then read the following paper:

YIELD OF COKE PER TON OF COAL.

At the meeting of the American Association, in Boston, there was quite a lively discussion between some of the members in relation to the amount of coke produced in carbonizing a ton of coal. One member reported an average yield of 42 bushels; another gave 40 bushels as the correct estimate, while a third member declared that 33 bushels was the maximum. Neither of these gentlemen, I regret to say, gave his results in pounds.

At the Pittsburgh meeting the same subject (the yield of coke per ton of coal) was again under discussion, when one member reported a yield of 73 per cent., or 1,635 pounds, while another seemed just as confident that 60 per cent., or 1,350 pounds, was a correct estimate.

Now, at first thought, it may seem a little queer that such a difference of opinion should exist among experts in the profession in relation to a subject with which it would seem we all ought to be perfectly familiar. But, in thinking the matter over, I came to the conclusion that perhaps, after all, there was not as much difference in the actual results as in the methods adopted in performing the experiments. Or, in other words, that one person may have weighed his coke hot, as it came from the retort; the next may have quenched his coke and weighed it at once, giving us in this way not only the actual weight of the coke but also that of the water which it had absorbed; while a third may have adopted an intermediate course, and let his coke lay for a day or two before weighing it, thereby allowing a portion of the water that had been absorbed by the coke to evaporate.

While this may not be a matter of very grave importance, I thought that perhaps a few facts and figures in relation to the subject might prove of interest to the Association. I accordingly made quite a number of experiments, and will give you the average results.

Now any person who has tried to carefully measure coke by the bushel must have been convinced that it is an exceedingly difficult thing to do in a satisfactory manner. The pieces of coke vary so much in size that I found, while using the greatest care in filling the measure, it was impossible to obtain anything like uniform results. So that, where statements of results are made in bushels, considerable allowance must be made for the manner in which the coke is packed into the measure. For instance, I found that a bushel of perfectly dry coke, measured as it came from the retort, weighed 31 pounds. Take the same coke and break the large pieces in two, and a bushel will weigh 34 pounds; while if we go a little further, and reduce the coke to the size of stove coal, a bushel will weigh 38 pounds.

In making the tests to determine the yield of coke per ton, the coal used was Youghiogheny.

Charge for each retort	250 pounds.
Duration of charges	4 hours.
Yield of gas per pound of coal	5.17 feet.
Percentage of coke used for fuel	38 per cent.
Yield of coke per ton of coal	1500 pounds.
Percentage of coke produced	67 per cent.
Bushels of coke produced per ton	48+

In order to show the allowance that should be made in estimating the yield of coke, when it is weighed after being quenched with water, I will give you the average results from the same experiments as those given above.

In this case the coke was weighed one hour after it had been drawn from the retort. Only enough water was used to cool the coke so that it could be handled. The results show the presence of 300 pounds of water in the coke produced from a ton of coal:

Yield of coke per ton	1800 pounds.
Percentage of coke produced	80 per cent.
Weight of coke per bushel	38 pounds.

It may be well to add as a postscript, for the information of those who have an abundant supply of water and believe in disposing of it under the name of coke, that I found, by careful experiment, that perfectly dry coke will actually absorb 75 per cent. of its own weight of water.

Discussion.

The President—What sized bushel do you use in measuring?

Mr. Allyn—We use a bushel containing 2747 inches.

Mr. Greenough—I think the paper of Mr. Allen is a very interesting document, and the subject is one as to which there has been a great deal of discussion heretofore, but without arriving at any satisfactory conclusions. I have no doubt that the difference in the yield of coke which the different companies give arises from the different ways in which they measure it, and the way in which they break it up. We have been making some experiments with regard to this matter. We had the coke measure which we used carefully verified. We use a ten-bushel measure, in which ten busnels of coke are put. It will hold ten bushel baskets on which the coke has been shoveled—not heaped as high as you can heap it, but put on so that it would run off. It is what might be called a heaped bushel. The box is tested by those bushels; and the box, although it would be really a ten struck bushel if it were straight across, is heaped up in the same way, and the coke is shoveled into it and allowed to run off. So that our ten-bushel measure really contains ten bushels heaped. I made some figures, which did not turn out in the way I expected they would; but the coke measures were no doubt correct. We had all the coke weighed hot, as it came from the retorts, and the weight was about 68 per cent., which agrees very nearly with Mr. Allyn's statement, and is about what it ought theoretically to be. The amount of coke which we got, in bushels, was in every case over 40. It ran from 40½ to 44 bushels in four different experiments of considerable length. So that when we talk about bushels in this part of the country, I have no question that everybody about here makes over 40 bushels. Why they make so little in New York I do not know. I would criticise Mr. Allyn's statement of the percentage of coke used. I would suggest to him that the percentage of coke used, and which he calls 38 per cent., would be several per cent. larger if the quantity of bushels made per ton was reduced to what most of us are able to get. If, instead of making 48 bushels, he were making 43 or 44 bushels, his percentage of coke would be 40 per cent. instead of 38 per cent., which would correspond, I think, more nearly to the measurements which the rest of us have made.

Mr. Armington—I do not wish to throw any doubt upon the statements of my friend Allyn, but it reminds me of a story which I heard a great many years ago of a man who had been catching rats. He said he knew that on one occasion he had caught 99 rats. Some one suggested to him that he should make it an even number; but he replied that he would not add another rat to please anybody. Our friend has got up to the point where he produces 48 bushels of coke. If I were in his place I would make it an even thing, and call it 50.

Mr. Allyn—You would not believe me if I did.

Mr. Armington—The Boston and New York bushels ought to correspond, but they do not. Some how or other we have got to be a little more liberal in our end of the country, and we give people a little larger measure for a bushel. I really cannot understand how 48 bushels of coke (unless it is only partially worked off) can be measured out of a ton of coal. I can imagine how you can get 48 bushels from coke drawn out in a hot state and measured while the pieces were caked, and 18 or 20 inches square; but how you can get 48 bushels from thoroughly carbonized coal I do not understand. I would like some light on the subject; and I would like to have our friend round out an even 50 bushels per ton if it is possible for him to do so.

Mr. Stedman—I will ask Mr. Allyn if his measure was an ordinary bushel basket, or a measure made for the purpose.

Mr. Allyn—It was a measure made for the purpose, and supposed to contain precisely two bushels of 2747.7 inches. The measure adopted by the American Association is 2747.7 for the heaped measure, and 2150 for the struck measure.

Mr. Armington—Was it a cylindrical or a square measure?

Mr. Allyn—A square measure.

Mr. Lamson—We have tried experiments without number, and they all averaged 42 bushels. We tried it over and over again. After the discussions in the American Association, which met here in October, 1881, we went through a lot of experiments to verify the matter, and 42 was the average. If Col. Armington will pay us a visit, I shall be very glad to show him where we get so much coke.

The President—We made some experiments a year ago, and they agreed substantially with Mr. Lamson's statement of 42 bushels, on the average, from Penn or Westmoreland coal. We repeated the experiments at both stations, and they came out substantially the same.

Mr. Cabot—We have made a great many experiments, and I have arrived at the conclusion that about 42 bushels, as a general thing, is the fair average for a ton of coal.

The Secretary—To make our statistics reliable, I think there should be a statement of the kind of coal used in each particular case.

Mr. Allyn—I stated that I used Youghiogheny coal.

The Secretary—I did not so understand you. The others have not stated what they used.

Mr. Lamson—I was speaking of what I supposed all the members referred to—Youghiogheny, Penn, or Westmoreland coal.

Mr. Greenough—I will state, for the information of the gentlemen, that we have always used American coal. Of course, if you use some of the Provincial coals you would not get as much coke.

Mr. Armington—Boston has always been noted for burning the very largest amount of Provincial coals. We use on an average each year about 60 per cent. of Penn and Westmoreland coal. Last year our cannel was between 13 and 14 per cent., and our West Virginia coal made up the balance of 100 per cent. I undertake to say that if you will take the standard bushel, as established by this Association, and take those three coals and measure after a year's work, there is not a gentleman here who can figure over 38 bushels to the ton. It may be that they use a kind of coal down here in Boston that increases in size very much, so that when they draw it out a peck of it will fill a bushel measure. They may use that kind here; but we use a kind that shrinks in carbonizing a good deal. But with the coal that we use I am positive upon the subject that there is not 38 bushels of coke to the ton of coal.

Mr. Greenough—Have you not raised five bushels since you were here last?

Mr. Armington—When I was here last I said 33; now I have gone up to 35, because I use the standard bushel. If you will take the mixture I have stated, you will not get over 38 bushels.

Mr. Greenough—Then you have gone up five bushels, for you only allowed 33 bushels last year.

Mr. Armington—That was with a different mixture of coal.

Mr. Cabot—I would like to ask my friend from Brooklyn whether the difference in his measure may not be accounted for by the quantity of cannel coal that he uses. I understood him to say that he used about 15 per cent. of cannel.

Mr. Armington—I said that I used between 13 and 14 per cent.

Mr. Cabot—Of course you do not get a large amount of coke from that. That may make up the difference. We get a very fair candle power from Penn coal alone, without a very large amount of cannel coal.

Mr. Armington—Do you mean that the Boston Gas Light Company gets that?

Mr. Cabot—I mean we in this neighborhood. I do not mean myself personally.

Mr. Coggshall—For the last two years I have used Youghiogheny coal, and have ranged from 40 to 42. Previous to that we used Kanawha coal, and could only get from 33 to 34 bushels of coke.

The President—Does Col. Armington carbonize his different kinds of coal together or separately?

Mr. Armington—We carbonize them together. We make a mixture right on the floor.

The President—Then in the figures which you gave you included the cannel in the mixture?

Mr. Armington—Certainly. We measure our coke from time to time, and know just what we are doing. When our final sales are wound up we find that we have from 33 to 38 bushels of coke per ton of coal carbonized, which we have disposed of, or used under our own fires.

Mr. Greenough—How many bushels do you sell to a ton of coal?

Mr. Armington—That depends altogether upon the carbonizing. We use in our retorts 27 per cent. of our coke. When I say 27 per cent. I mean 27 pounds of coke to every 100 pounds of coal carbonized.

Mr. Greenough—Then it is 40 per cent.

Mr. Armington—I mean to say that we sell, each year, between 55 and 56 per cent. of the amount of coke made, and that we average 35 to 38 bushels of coke to the ton of coal carbonized. If we use 55 or 60 per cent. of Penn or Westmoreland coal, we get a larger amount of coke; but if we use the West Virginia coals, then we fall back again in our make of coke.

Mr. Lamson—If Col. Armington is making his estimate of the quantity of coke made per ton of coal from the balance on hand at the year, then he is differing from the rest of us. We are talking about what we are actually making in experiments with these coals. What may be done at the end of the year is quite a different thing.

Mr. Cabot—Some of the gentlemen here may get a wrong impression from Col. Armington's remarks when he speaks of using 27 per cent. of coke. We are in the habit of speaking in this way of the percentage of bushels instead of pounds. Those of us who are using 35 and 40 per cent. of coke under our benches do not want to be discouraged by Col. Armington's statement that he only uses 27. If I understand him, he is using 27 per cent., weight for weight. That is very nearly equal to what we call 40 per cent., because we go by the bushel. I do not want our people here to be discouraged by reason of any misapprehension of his statement. He goes by pound per pound, while we measure by the bushel. When we say that we use 30 or 40 per cent. of coke we mean 30 or 40 per cent. of the measurement, and not of the weight.

Mr. Armington—Your way of computing that goes back to the time when they used to measure coal from the pile into the retort, instead of weighing it. Now we are in the habit of weighing it.

Mr. Cabot—I think your way is the more correct, and I should be very glad to have the Association adopt it, and hereafter weigh the coke instead of measuring it. Then we would all understand what was meant by the percentages given as the result of experiments.

Mr. Stedman—I beg leave to differ with the gentleman in that regard. It seems to me that a percentage, based upon the number of pounds of coke used in carbonizing a certain number of pounds of coal, does not convey any idea unless you convey with that idea a statement of the condition of the coke when it was weighed. If, as our friend from Cambridge asserts, coke is capable of absorbing 75 per cent. of its own weight in water, then coke in such a condition as that is a very different article, when you come to use it for fuel, from what it would be if used perfectly dry. I think that, so long as we sell coke by weight, we shall convey a much more intelligible notion of the amount of coke we are using if we calculate the percentage of coke used on the basis of the whole coke produced. This idea of weighing it, and calculating the percentage by saying that so many pounds of coke will carbonize so many pounds of coal is a kind of English idea—"don't you know?"—and seems to have been adopted recently on that account more than anything else. It confuses our counsels here very much if we undertake to introduce the two units of measure, and then have to explain every time the exact basis upon which our calculations are made. When I say that I use 40 per cent. of the coke made, I think everyone will understand that out of every 100 bushels of coke made I use 40 bushels for fuel; but if I say that I use 20 per cent., then you would have to go into an estimate of how many pounds of coke I make per ton of coal, in order to get at the amount of coke I use. If I produce a definite number of pounds of coke all the time from a ton of coal, then we can easily get at the figures. But it seems to me that that is such a variable quantity, and is so subject to a great many miscalculations in ascertaining it, that it would be quite as well if we stick to the old Yankee method in estimating percentages of coke.

Mr. Armington—That would be all right if carried out; but I undertake to say that if you were to ask our friend Stedman what he considered a ton of coal, he would reply, "2,240 pounds, don't you know?"

Mr. Greenough—I would like to say to Col. Stedman that he is mistaken in supposing that is the English system, because the English do not use it at all; they use the New York system—percentage of volume; and the method of computing percentages by weight is the invention of the French and Germans, and not at all of the English.

Mr. Nettleton—Does Mr. Allyn measure his coke in a measure containing just 2747 cubic inches?

Mr. Allyn—It contains just twice that; it contains two bushels.

The President—If there are no further remarks on this subject, we will now listen to the reading of the next paper, by Mr. William Yorke, entitled, "Comparative Value of Retorts."

Mr. Yorke thereupon read the following paper:

COMPARATIVE VALUE OF RETORTS.

When I came to Boston last evening I had no idea of reading a paper to this Association. In fact, I had not prepared any. Just before leaving home I had written a letter to a party manufacturing retorts, and in doing so I sought to impress upon his mind the importance of making a good retort; and I drew up a few figures showing the comparative values of retorts, and will read you the brief abstract which I have made. It seems to me that in the purchase of retorts, tile, etc., we are apt to consider it of more importance to save a few dollars in the cost than to obtain a good article at a little higher price.

I hold that a poor article of retorts or tiles is dear at any price. For instance, suppose a fair common retort, one that would produce 6,000 cubic feet of gas per day for 15 months (or about 2¼ million cubic feet to its life time), to cost $20 at the factory. Now, with all the incidental expenses, including the pulling down of an old bench of fives and resetting it ready for action, the expense would foot up to about $275, or an average of $55 per retort. Now, if a better quality of retorts would last 18 months (3 months longer), they would be worth comparatively $29.17; or if a superior article would run 21 months, it would be worth $35.72. And again, if a bench gives out in 12 months, it would reduce their value to $6.25; and if they break down in 9 months, they would not only be worthless, but minus $14.66 (comparatively).

The proper way of estimating the value of a retort is by a comparison of the price with the time the retort will last and the amount of gas it will make in its life time.

My figures show that a retort that will run for 21 months, producing 6,000 cubic feet per day, will have a comparative value of $35.72; while if it will

run only 9 months, it will be not only worthless, but will be $14.66 worse than nothing.

Discussion.

Mr. Allyn—I would like to enquire of Mr. Yorke what the average duration of his retorts is.

Mr. Yorke—About fifteen months. I have had them break down in six months; but only once.

Mr. Cabot—What was their value when they broke down in six months?

Mr. Yorke—I have stated the estimate at nine months.

Mr. Allyn—What is the difference between tar fires and coke fires, in the duration of retorts?

Mr. Yorke—Very little. I estimated last year that they would run about twelve months. My average yield was 38,000 to a bench of fives; and for two months before they broke down I made 45,000; but I run with a pretty heavy tar fire.

Mr. Allyn—What was the size of the retorts?

Mr. Yorke—They were 14×24, and 9 feet long. I think a retort will run as long, or make as much gas in its life time, with a tar fire as it will with coke. I let two of my benches down this winter which were fired with tar, and then fired them up again; and there was very little cracking.

Mr. Cabot—What is your experience when you have been obliged to let down your benches once or twice during the year; have they been as durable as when there has been a continuous fire under the them?

Mr. Yorke—I have had no breakage in that respect; but I do not think they would last as long where they were let down occasionally as they would if continuously used. I should add that of course it injures a retort to let it down and fire it up frequently; but I do not think there is any more injury done when fired with tar than when fired with coke. I fire, however, with both tar and coke.

The President—Do you consider it to be more detrimental to a bench to commence firing a new bench with tar?

Mr. Yorke—No; but until this winter I have generally put in the tar under the bench after it has been used three or four months.

Mr. Cabot—I would like to enquire of Mr. Yorke why he did not fire the bench up immediately with tar.

Mr. Yorke—I have no particular reason, only I have learned from others, who have done it, that they are under the impression that tar would do more injury to a new bench than it would to an old one; I do not know from experience that such is the case. I do not burn tar in all of my benches. I use it in about one-half of the benches. I have generally put the tar in the oldest benches.

Mr. Cabot—That has been my practice also.

Mr. Taber—I would like to ask if any gentlemen have tried any of the English retorts, and if so, what result they have had with them. It seems to me that the retorts which I have seen on the other side of the water were very much harder than the retorts we have here.

Mr. Greenough—I can answer that to some extent. We have tried the English retorts, but have not found them to last any longer than the American. My impression is that the English retorts are not as hard burned as those used here or on the Continent. The English retorts are not meant to be subjected to such high heat; and some which I have used here did not stand the heat at all.

Mr. Allyn—I have a portion of a bench with the Cliff retort which has been running for three months. The lower and middle retorts are made by Cliff & Sons; one of the upper retorts was made in Baltimore, and the other was made by Mr. Gardner of Pittsburgh. I thought that I would in that way get a general average by running a bench on its merits. I have only run it for three months; so the retorts are still all in good condition; but I think that the Baltimore and Pittsburgh retorts are in fully as good condition at present as are the English retorts.

Mr. Yorke—What is the average production in the life time of your retorts?

Mr. Allyn—I think the average for the last retorts was about three and a-half million feet.

Mr. Yorke—What is the average at the Boston works?

Mr. Greenough—I cannot tell you exactly.

Mr. Yorke—I would like to get the average of other works in comparison with my own.

Mr. Greenough—We make a little over 7,000 feet per retort in twenty-four hours, and the retorts last from sixteen to eighteen months. Sometimes they reach much above that; and some break down at twelve months.

On motion of Mr. Sherman, seconded by Mr. Cabot, it was voted that the Secretary have 200 copies of the Address of President Slater printed and distributed among the members.

The President—We have with us at this meeting the late President of the American Gas Light Association, Mr. William H. Price, of Cleveland. We shall be very happy to hear from him upon the coke question, or upon any other subject which he may think of interest

Mr. Price—I did not come hear expecting to speak; I came to Boston on other business, and have been glad to be able to so time my visit as to permit me to attend the meetings of this Association. I have been very much interested in the papers which have been read, and in the discussions to which I have listened; but I do not feel prepared to make an address upon any subject.

I think that the coke question has been a good deal muddled. I acknowledge that I was myself a good deal muddled last fall at Pittsburgh on the subject, because I found that my engineer did not understand the matter as I understood it, and I was very much taken back when I learned that he did not sustain the position that I had there taken—that we were carbonizing our coal with 30 per cent. of the coke that we produced. After leaving the meeting and returning home, we discussed the subject among ourselves. I asked him to make a very careful examination of the whole subject, in order that we might know just where we stood, and in order that we might not misunderstand each other again. He instituted a series of careful investigations and experiments, and then brought to me a statement to this effect; in our old retort house, where we used retorts which are 8×14×23, we used 27.8 per cent. of the coke that we made in carbonizing. In what we call our new retort house, where the retorts are larger and a foot longer, we use 27.2 per cent. of the coke. Those are the results which we have ascertained. They are as near correct as we can make them; and I think they can be relied upon.

The President—You are now speaking of the results by volume?

Mr. Price—Yes; by volume. When we speak of a ton of coal we mean 2,000 pounds; whereas you speak or 2,240 pounds to the ton. We are likely to misunderstand one another when speaking about a ton. He finds that 60 pounds of Youghiogheny coal, or, more correctly speaking, of the coal mined by the New York & Cleveland Gas Coal Company, (and which is substantially the same as the Penn, the Westmoreland and the Youghiogheny; for we have repeatedly experimented with these coals, and find that there is scarcely any difference; the New York & Cleveland gas coal is a little harder, and handles a little better than the Youghiogheny coal) makes a bushel of coke; but it does not make a bushel of coke to sell, because out of it must come the breeze; so that practically it takes about 65 pounds of coal to make a bushel of coke for sale.

Mr. Cabot—Is your coke sold broken?

Mr. Price—We sell it in two forms. We have a machine for breaking it, and we sell the coke, which is thus broken, by itself. When I speak of 60 pounds of coal making a bushel of coke, I speak of it as it comes out of the retort, with the breeze in it. When it has been handled, and the breeze has dropped out of it, it is safer to reckon a bushel of coke to 65 pounds of coal. We have a machine for breaking our coke, so as to prepare it for the people who prefer small coke. We sell a part of it broken in that way, and a part broken in the ordinary way. Ordinarily, for manufacturing purposes, and for burning in grates, it is sold coarse. We have some customers who desire it broken to about the size of a hickory nut. We find that in breaking it up to about that size it shrinks about 12½ per cent.; and it takes 9 bushels of coarse coke to make eight bushels of cracked coke. So that while we sell it for two cents more per bushel, and we get something for cracking it, we lose by the shrinkage.

Mr. Greenough—I would like to ask Mr. Price if he has ever weighed the coke which he gets from 100 pounds of coal. We had some argument with regard to that matter while we were in Pittsburgh. Have you or Mr. Hyde gone over the figures which were then given?

Mr. Price—Yes; Mr. Hyde went over his figures, and found that he had made a decided mistake.

Mr. Greenough—I would like to bring to your notice the fact that the 65 pounds of coal which you say are required to make a bushel of coke as sold, only gives 34½ bushels of coke per ton of coal carbonized. That is a long ton. That is so much smaller than our make, and the percentage of coke which you claim to use is much smaller than ours, that if you made more coke your consumption of it would also be larger. I make this criticism of your figures.

Mr. Price—That may be. I accept the criticism; and will promise to spare no pains to be accurate, so that, by the time we meet again, we will be prepared to have the thing in such a shape as to stand any amount of criticism.

Mr. Armington—Do you use much coke for other purposes, except under the furnaces?

Mr. Price—No.

Mr. Armington—Then you must be selling over 70 per cent. of the coke which you make.

Mr. Price—Certainly we are.

Mr. Armington—That is a pretty large amount.

Mr. Price—I occasionally meet gentlemen who say to me, when I state this fact to them, "I suppose that it must be so, but I cannot see how it is done." In conversation the other day with a young gentleman of intelli-

gence, the son of a gas engineer, and himself a gas engineer, he told me that almost precisely the same thing was being done in Indianapolis. If you wish to write to Mr. Somerville, you can verify the statement. I cannot vouch for it. It was so stated to me by Mr. Walker, who said that our results were not very surprising, and that other people were doing as well. He is the son, I believe of J. H. Walker.

Mr. Armington—Do you use any cannel coal?

Mr. Price—We use some cannel in very cold weather; but we do not mix it, and it does not affect the percentage of the coke. I understood Col. Armington to say that in the measurement which he makes he counts in the results obtained from mixing his cannel and his coke. It must affect the result somewhat. The result from the cannel coal must be smaller than that from the Youghiogheny, and that may account for the discrepancy.

Mr. Armington—What do you get in Cleveland for coke?

Mr. Price—We sell coarse coke at 9 cents, and cracked coke at 11 cents. We sell about 70 per cent. and use the balance. Oftentimes in the winter, when the demand is very large, we substitute coal and sell all the coke that we make. We get more for our coke than it costs to supply its place with a good burning coal which produces the same results. Of course we find a great advantage in selling a good deal of coke at a fair price. I think that is one reason why we are able to sell gas at $1.50 per 1,000 feet.

Mr. Allyn—What is your yield from Penn coal per retort?

Mr. Price—Our yield from Penn coal is not far from 5 feet. Our yield per retort depends upon the charge. The charges vary from 225 to 275 pounds.

Mr. Allyn—I think, using a smaller percentage of coke for fuel, that the yield per retort was correspondingly smaller.

Mr. Price—No, sir; the yield is very good. You will say, in regard to our product, that I am not able to state exactly what the product from the coal is, and for this reason. Mr. Hyde and I were looking over the carbonizing book, and found that some months did not show as well as others. For the last year and a half or two years we have been enriching with naphtha, and I fancied that we got a more brilliant and whiter gas in consequence. I was anxious to accomplish those two things—to have a more acceptable gas, and to have it more brilliant and whiter. I think I am gaining in that respect. We have been using naphtha for a considerable period for enriching purposes. The gas produced from the naphtha goes in directly with the gas produced from the coal. I am not able to state with exactness just the product from the coal and the product from the naphtha; but I am safe in saying that the average during the year is about 5 feet for each pound of coal.

Mr. Greenough—I would like to call your attention to some hypothetical figures, which I do not wish to state as being your admission, but which may possibly be worth considering. Going back to your previous statement that 65 pounds of coal made a bushel of coke to sell, it would take 34 bushels to a ton of coal, and 27 per cent. of 34 bushels is something over 8 bushels. If, instead of making 34 bushels, you happened to have made in the vicinity of 40, like the rest of us, and that balance had gone into your coke consumption, then, instead of using 27 per cent., you would have been using 35 per cent.—which comes a great deal nearer to what most of us are able to do. I would like to suggest for your consideration the question whether you do not make more coke than you thought you did.

Mr. Price—I am aware that it is difficult to get at the exact facts in regard to any matter. I feel that more and more as I grow older. In all these discussions with regard to the use of gas for heating purposes, for instance, it is exceedingly difficult to fix upon anything which we might call a fact, with sufficient positiveness to apply it to another case. For instance, when Mr. Dunning said that he had very poor success in using gas for raising steam with which to heat his house, I have no doubt he was correct in the statement as he made it, and according to his experience; but, at the same time, I think it may be possible that that result was somewhat modified by the way in which he used it, and that he might have got a better result with some other kind of boiler. So far as using gas for heating purposes is concerned, I think we have not yet arrived at anything like perfection in the matter; and it will not do to rely upon an isolated case to establish a principle. And it is the same in regard to the coke question. It is very possible that we are not as accurate as we think we are. I can only say that we charged Mr. Hyde to be very careful and accurate, so that we might know just what we were talking about. I knew very well, when I made the statement that we were using so little coke, that it would be doubted by a great many; but for a long time I have been accustomed to say that we make a thousand feet of gas with a bushel of coke, and this is doing better than that; and it has been a long time since we have done worse than carbonizing coal enough to make a thousand feet of gas with a bushel of coke. I do not think there is anything peculiar about our settings. They are very small, and I think they are very effective.

Mr. Stedman—Will Mr. Price tell us what coal costs in Cleveland?

Mr. Price—It is sold by the ton, and screened through a 1¼-inch screen. The cost varies. Last year it cost from $3.25 to $3.35 per ton, delivered in Cleveland. It costs us, in our house, about $3.50.

Mr. Cabot—That is one reason why you can sell gas at $1.50.

Mr. Price—That is one of the points.

Mr. Armington—Several gentlemen were getting quite interested in your remarks, and I was very glad to hear you qualify your statement of cost of coal by saying "about" that figure. By the time you have spent as many hours in this city as I have you will find that it is very necessary to have a littte lee way in respect to most of your statements. If my friend Greenough should prod you as he sometimes prods me, you will find it necessary to have a good deal of leeway. I merely state this as a warning of what you may expect.

Mr. Price—I hope no one will understand me as desiring to boast of our results. That is not at all my intention. We practice very close economy; nothing upon ornamentation. We try to be thoroughly practical. We run our office very cheaply. We are able in that way to keep the expenses down, and to produce gas at a moderate cost, and to give the people the benefit of it.

Mr. Greenough—I would like to call the attention of Mr. Price to a statement just made, which strikes me as being a little remarkable, and that is that he works off a thousand feet of gas from a bushel of coke. That is, from 60 bushels of coke in the fire he can make 60,000 feet per bench of retorts. That is certainly very large working—better than we are able to do here. When we were in Pittsburgh certain statements were made by Mr. Hyde, in perfect good faith, no doubt, as to the weight of coke that he got from 100 pounds of coal. I think he said that it was about 60 per cent. I stated at that time that I knew that was impossible, because there was 67 per cent. of fixed matter in every 100 pounds of coal, which must be there. I took issue with his figures. You now frankly say that he has revised those figures, and finds that he was mistaken. The figures now given are that 65 pounds of coal make a bushel of coke, and that he uses 27 per cent. of that to fire his benches. I call your attention to the fact that that is from 6 to 7 bushels of coke less per ton of coal than we are making here. The percentage of his consumption must, it seems to me, be increased by a portion of that loss of coke. That lost coke must be burned somewhere. That would modify the percentages which he gives us of the coke which they use in the fire. It would seem to be an impossible quantity to get such a heat from. I say this with all respect and deference, and with an appreciation of the frankness with which he has made his figures known.

Mr. Price—I am willing to leave the question open; and if I live until next fall will report the result of further experiments. I am not at all unwilling to be criticised; I expect it. I know that it is common to use from 40 to 60 per cent. of the coke produced in carbonizing; I know that people receive with astonishment the statement that it can be done with the small amount indicated by our experiments. If we are mistaken in that regard we will confess it. We will say that we did not mean to make any mistake, but that we were nevertheless mistaken. But in the meantime I would like it to stand as my engineer has assured me is the fact. I had no intention of taking up so much of your time. I am very happy to meet you all, and to see that you are in good health and evidently so very prosperous. I think the gas interest in this country was never more prosperous than it is to-day. From all directions come reports that more gas is being made than ever before. There is evidently a cause for this prosperity. I attribute it, in the first place, to the general prosperity of the country, and, in the second place, to the increasing desire and demand for more light. The people demand a more thorough lighting of their houses and streets; and the increased consumption of gas is due very largely, as I believe, to the electrical light craze.

The President—I have here a tracing of an arrangement, the object of which is the working of purifiers with a system of valves, dispensing with the center seal. Those who wish to examine the drawings are now afforded an opportunity of doing so.

Adjourned until 7.30 P. M., but at that hour so few members attended that the Association adjourned until 10.30 A. M., Feb. 22, without transacting any business.

SECOND DAY, FEB. 22.—MORNING SESSION.

The Association was called to order at 10.30 A. M.

The Secretary read the following telegrams:

NEW YORK, Feb. 22, 1883.

A. B. SLATER, President New England Association of Gas Engineers:

Thank each and every member for the kind expressions of sympathy, and believe me, I appreciate them fully. I trust time will bring all things right, and that I may yet see many of you making 100,000 cubic feet per bench per day.

G. W. DRESSER.

PHILADELPHIA, Feb. 21, 1883.

A. B. SLATER, President New England Association of Gas Engineers:

Please extend invitation to Association to witness test of four Clerk gas engines now on exhibition here. Please wire if any will come; also date, etc.

WM. W. GOODWIN.

On motion of Mr. Stiness the invitation of Mr. Goodwin was accepted, with thanks.

IN MEMORIAM.

The committees appointed to draft suitable resolutions respecting the death of members during the past year, presented the following resolutions:

Whereas, it has come to the knowledge of this Asssociation of the death of Mr. Edwin Keith, late Treasurer and Superintendent of the Taunton Gas Light Company. Therefore be it

Resolved, That in the death of Mr. Keith, this Association has lost one, who, although not taking so active a part in the deliberations of the Association as some others, owing to his very conservative, and retiring disposition, yet he had its success very much at heart, and these qualities were exemplified by the manner in which the discussions of the Association were treasured up in his mind. He has left us an example of sobriety, honesty of purpose and just dealings worthy of imitation.

HENRY B. LEACH.
EDWARD G. PRATT.
Committee.

WHEREAS, in the dispensation of Divine Providence, Mr. Aaron Akerman, a member of the New England Association of Gas Engineers, has been removed from his earthly labors.

Resolved, That the members of this Association would express their deep regret at the loss of their late respected associate, a gentleman who faithfully and honestly served his employers and who was well qualified to discharge the duties of his office.

Resolved, That the foregoing be placed on the records of this Association, and a copy sent to the family of the deceased.

THOMAS R. MARTIN.
DAVID MOORE.
Committee.

The resolutions were adopted by a standing vote, and the Secretary was instructed to inscribe the names of Mr. Keith and Mr. Akerman on a memorial page in the printed record.

THE PRESIDENT'S PRIZE FOR "GREATEST SAVING IN FIRST COST OF GAS."

The President—At the semi-annual meeting of the Association held in New Bedford, August 16, 1882, a prize of $50 was offered by the President to be awarded to the member who should effect, at the works under his charge, the greatest saving in the first cost of gas per 1,000 feet, during the six months ending Dec. 31, 1882, as compared with the previous six months ending June 30, 1882. A circular was issued by the Secretary, giving the particulars in which such saving should be effected, and the data which competitors were expected to furnish to the committee appointed to make the award. In offering the reward it was not the intention to frighten members from making any effort to compete for it by furnishing statements of economical results; but it seems that there has been no competition, or at least no data have been furnished to the committee. If there is any probability of a competition in the matter, the offer will be continued for another year.

Mr. Sherman—The conditions under which that reward was offered ruled out a majority of the members of the Association from the competition; and I think that it would be well to revise the conditions, particularly with respect to the matter of testing the gas with a bar photometer at a distance of not less than half a mile from the place of manufacture. Very few members are in a position to make such a test; as most of the members, who have a bar photometer, test the gas at the works. At least nine-tenths of the members are ruled out from the competition by that single condition.

The President—So far as that, or other conditions of the award are concerned, I am willing to leave the matter in the hands of any committee you may appoint; and they may revise the conditions as may seem to them best.

Mr. Taber—I move that a committee of three be appointed by the President, to offer a prize, under the general conditions stated in the offer made last year, with power to revise or modify the conditions stated in the circular.

The motion was agreed to, and Messrs. Taber, Sherman and Neal were appointed such committee, and they retired for consultation.

[To be continued.]

The "Standard" Washer-Scrubber.

Among recent contracts closed for the "Standard" washer-scrubber are two, of one million cubic feet daily capacity, for the new Commercial Point works of the Boston Gas Light Company; one of five hundred thousand cubic feet capacity for the Roxbury (Mass.) Gas Light Company; also one of same size for the Denver (Col.) Gas Light Company, and one for the Wilmington (Del.) Gas Light Company. One of a quarter of a million capacity has been ordered for the works of the Derby (Conn.) Gas Light Company.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

NOTES ON THE DAMAGES TO GAS WORKS ON ACCOUNT OF THE RECENT FLOODS.—The disastrous results occasioned by the late unprecedented floods in the region of the Ohio Valley are still fresh in the minds of the people of the country. As was to be expected, the gas interests of this portion of the States suffered very material loss. Our thanks are due to the gentlemen who so kindly furnished us with the statements which we publish below.

At Youngstown, Ohio.

Mr. George Cornell, Secretary and Treasurer of the Youngstown (Ohio) Gas Company writes:

"I am happy to state that the works of our company were not in the least damaged by the recent flood. I saw in your paper of Feb. 16 that some of our lampposts were washed out by the current; but I have not heard of it from any other source, and I think our watchful superintendent would have found it out if such had been the case. There were some gasoline lamps on a submerged street, and some of these might have been loosened from their foundations. Our works are quite away from the river; and we have sometimes thought, when paying out heavy water rates, that perhaps we had better have placed them nearer to a water supply. But when the high water comes we rejoice in our remoteness from causes which have so damaged the gas business in other places.

"We have just put in an Otto gas engine to run our exhauster in place of a steam engine which we have used for some years. It does the work well thus far."

At Marietta, Ohio.

Mr. McMillin, lessee of the Marietta (Ohio) gas works, sends the following:

"The Marietta gas works were overflowed twice during the month of last February. The water reached the fires on the 7th, and by the 9th it was half way up on top retort. The water began to fall on the evening of the 9th, and we fired up on the 12th. We sent out gas on the night of the 12th; but the end was not yet. On the night of the 15th we were drowned out again. On the 19th we fired up again, and sent out gas on the 22d. We had 130 meters under water; the approximate damage to works, meters, coal, etc., amounted to about $1,200. Our works was a water gas works most of the time during the month of February; but we are making coal gas again as usual."

At Madison, Ind.

Mr. Paul Hendricks, Secretary of the Madison (Ind.) Gas Light Company, furnishes the following statement:

"Yours of March 6th at hand. I scarcely know how to reply to the inquiries regarding the effects of the February overflow on our works, as we have as yet made no elaborate estimate regarding the same. Of course the altitude reached by the waters of this Valley during the late inundation is known to be beyond any other record since the settlement of this region. Its operation upon our works, however, may be summed up as follows:

"The water extinguished our fires on the 11th of February, at 4 P.M., shut off our seals at 5:20 P.M., covered our valves during the night, and at 9 A.M. on the 13th had filled the overflow of lowest holder and shut gas off entirely from the city. The greatest height of water was within about two inches of the top of the highest retort, gradually decreasing until the 24th, when we were enabled to raise sufficient gas for city. All the benches being at white heat at time of water contact, of course great damage resulted. We have been laboring with the old benches, and have added a new one to meet our regular demand.

"The damages resulting are the practical inefficiency of benches *before used*, and the losses resulting from our patrons having had to supply themselves with coal oil during the period of intermission of gas supply, and the possibility of their still continuing its use. How great this damage may prove to the interests of our company is as yet unknown. The flood of 1882, depriving the city as it did of gas light on two nights only, has been estimated as injurious to the company to the amount of $1,200. This time there were eleven nights in which the city was deprived of light. Other damages, such as fences and walls, and mud deposit in our coal and coal sheds, we have not as yet considered.

"Our annual manufacture equals 8,000,000 feet; we have 169 public street lamps and 350 consumers. For six years past our business has been on the ascending scale, and it is now believed that we will be able to pay a fair dividend. The effect of the flood along our whole border has not been, and cannot well be, estimated. The main damage in this Valley extends from Cincinnati out. The damage along the tributaries will perhaps never be correctly estimated.

"I know of no information I could give, as added to above. I thank you for the inquiry, and will be pleased at any time to give further information, should I possess it, in regard to gas interests here."

At Louisville, Ky.

Mr. Benjamin Rankin, of the Louisville (Ky.) Gas Light Company, sends the following interesting account of the trouble experienced at this point:

"During the recent flood in the Ohio river the gas works in this city were compelled to suspend operations for three days and nights. Fortunately for us the moon was near the full and the weather was clear, so that the inconvenience on the streets was comparatively slight. Business and domestic pursuits, however, were greatly interfered with. But, thus far, ours was but the common experience of all the cities and towns on the river from Pittsburgh to Cairo; nor should I trouble you with anything in regard to the matter were it not that the circumstances developed some very unexpected results, which may be interesting to the fraternity. On the night of Feb. 15th we were making gas at the rate of 33,000 cubic feet per hour, not anticipating any serious inconvenience for several hours, if at all, when suddenly the seals in the purifying house commenced blowing. The conclusion was that the water had, in some way, found an entrance into the pipes, and we were trapped out. On examination the pipes and connections were found to be free from water, but the gas still refused to pass the purifiers, and it was impossible to keep the seals quiet. The charges were all drawn, and several hours spent in a fruitless search for the obstruction. During this time the water continued to rise, and when morning came had submerged three of our holders; but, having closed the valves to inlet and outlets, we hoped to be able to keep the mains free; and, having another holder situated far above the water, we set to work and soon had the pipes free from water and charged some retorts, but found that the obstruction still remained. The pipes taking the gas from the purifiers to the station meters were entirely under water, and the only way of access was by removing the meter connections, which was done, and the cause of the trouble discovered. The pipes from purifiers to meters and from meters to holders are 18 in. diameter; the meter connections are 12 in. diameter; and both the 18 in. and 12 in. were filled with naphthaline. I deem it proper here to say that prior to this there had been no indications of more than possibly a trace of naphthaline about the works, nor has there been since the steaming out that followed as the water receded. In conclusion I will very briefly give the conditions that seem to have been favorable for the rapid development of naphthaline. The pipe conducting the gas from the purifiers to the meter is about 80 feet in length; one-half the distance, it is covered with earth, the other half runs through cellar of meter house, and was covered, at the time, with water from the river. The temperatures given are in the direction of the gas, and were taken at 5 P. M., Feb. 15, 1883.

At inlet to condensers	121° F
" " scrubbers	96° "
" " purifiers	84° "
" " station meters	65° "
" " street mains	65° "
Atmosphere	49° "
Water surrounding pipes in cellar	40° "

"We are all straightened up again and in good running order; the damage to the works proper is very trifling."

At Titusville, Pa.

W. H. Towler, Esq., Secretary of the Titusville (Pa.) Gas and Water Company, communicates the following:

"In answer to yours, would state that the flood drowned us out for a couple of days only, and our company suffered no especial damage. Had we not been caught with a low holder it might have been better for the public and ourselves."

We had hoped to give with this number a full descriptive account of the trouble experienced at the works of the Cincinnati (Ohio) Gas Light Company, but are obliged to defer doing so until a later date.

Electric Lights at Newport, R. I.—Newport (R. I.) is operating the Weston "arc" light on some of its streets. The number of lights employed for street lighting purposes is thirty; each light costs the corporation sixty-eight cents per night. The depot of the Old Colony Railroad is also lit with the Weston light, requiring ten lights to do the work in a rather unsatisfactory manner. It is more than surmised that the people who formed the corporation for introducing electricity into Newport rather wish they had their money back.

Price of Gas in Manchester, N. H.—Mr. L. P. Gerould writes us that the Manchester Gas Light Company charges $1.80 per thousand for gas supplied to general consumers, and $1.60 for the gas used by the corporation.

Reduction in Price of Gas at Worcester, Mass.—At the monthly meeting of the directors of the Worcester Gas Light Company, it was voted that after July 1st the price of gas remaining still at $2.25 per 1,000 feet, as by the contract with the city, 25 cents per 1,000 shall be deducted from all monthly bills paid before the 15th of each month. The agent's report showed that the illuminating power of the gas during the month of February averaged eighteen candles.

Officers Elected.—At a meeting of the directors of the Vicksburg (Miss.) Gas Light Company, held March 16th, George W. Cox was elected Secretary, and John Watt, Superintendent.

Death Follows in Its Wake.—It is not a great while since the works of the Peoples' Gas Light Company have ceased to manufacture coal gas; the concern having been absorbed into the system of the Fulton Municipal Company, of Brooklyn, the manufacture of gas from coal was suspended, and the consumers of the Peoples' Company have been supplied with the illuminant which has earned for itself, in a very short space of time, such a sterling and stirring reputation as a taker-away of human life. From a careful and painstaking search into the facts we learn that no case of death resulting from the inhalation of illuminating coal gas has ever before taken place in the district supplied by the mains of the Peoples' Company. Fifteen days after the Fulton Municipal gas was turned on, a fatal case of suffocation is reported. The case is that of Mrs. Hannah R. Johnson, aged seventy-five, who was found dead in her bed, on the morning of March 15th. The old lady, who resided at No. 215 Graham street, was in a delicate state of health; and was in the habit of leaving the gas lit when she went to bed. It is supposed that she left the gas burning, as was her custom, and, that from some cause or other, the light had become extinguished; the consequent vitiation of the atmosphere in the room causing death by suffocation.

Two cases of suffocation are also reported from the Western section of Brooklyn City. The members of Mrs. Togetti's household at No. 230 Livingston street were rather surprised at the non-appearance down stairs of the two servant girls, connected with the establishment, on the morning of March 15. Not having made their appearance at the usual time, Mrs. Togetti sent up to the room occupied by the servants to ascertain the cause of their tardiness. On opening the door of the apartment a strong order of escaping gas prevailed, and the reason of the non-appearance was at once apparent. The young women were found side by side in bed in an unconscious state. A messenger was at once sent for the family physician, and the windows of the room were thrown open. When the doctor arrived the girls had in a measure recovered, and after administering restoratives pronounced them out of danger. The girls, before going to bed, had turned out the gas; but, in doing so, twisted the burner cock, which was loose, too far around, thus allowing an escape of gas to occur. The names of the persons who so luckily escaped death are Ann Riley, aged thirty-one, and Mary Riley, aged twenty-two.

These disasters have aroused the attention of gas consumers in Brooklyn, (more especially those who burn the gas now supplied by the Peoples' Company), to the facts that grave dangers may be in store for them in the future. Several correspondents have sent communications to the daily papers inquiring as to the cause of the number of deaths from inhalation of illuminating gas in the city of Brooklyn since the Fulton Municipal Company commenced operations there. It is reported that the attention of Mayor Low has been called to the matter, and it is very likely that an investigation will be made.

We understand that Secretary Benedict, of the Fulton Municipal Company, has forwarded to the Mayor a letter in which he asserts that, on account of the success which his (Benedict's) company has met with, the coal gas companies have circulated reports that the gas furnished by the Fulton Company is injurious and noxious to life and health. It is further reported that he sent to the Mayor some printed matter bearing on the truth and falsity of such reports. We will hazard the opinion that the list of cases of death and suffocation, prepared by Mr. Higgins, of Richmond, Va., and published in last issue of this Journal was not among the evidence offered.

Health Commissioner Raymond, in an interview which he accorded to a representative of the Brooklyn Daily *Eagle* said, among other things: "I don't know how water gas is affected by the presence of greater quantities of carbonic oxide in it than coal gas, because, for all I know, there may be other conditions present in the gas which would modify the danger or counteract the poison influence to a certain degree; I should say, however, that all things being equal, the gas which contained the most carbonic oxide would be the most dangerous. I cannot, however, express myself now as to the good or bad points of either coal or water gas."

If Brooklyn will lead off in the direction of ordering a thorough and searching inquiry into this question, she will deserve the thanks of every city and town in the country where gas is manufactured.

Obituary Note.—The many friends of Mr. John H. McElroy, engineer of the Pittsburgh (Pa.) Gas Light Company, will learn with sorrow that he has met with a painful loss in the decease of his accomplished wife. Mrs. McElroy's death occurred on the 16th of March.

One More to Go on Record.—William Mulcahey, forty years of age, of No. 1,435 Filbert Street, Philadelphia, Pa., was found dead in his bed at the Brooklyn Bridge Hotel, No. 48 Chatham street, New York City, on the morning of Saturday, March 18. He had been suffocated by illuminating gas. The body was removed to an undertaker's in Pearl street.

Why was it not Lit by Gas?—The Ford street bridge crossing the Schuylkill river at Norristown, Pa., was destroyed by fire on the evening of March 15. The fire was caused by the explosion of one of the gasoline lamps used for lighting the bridge. The explosion occurred about nine o'clock, and before ten the structure had fallen into the river a burning mass.

The bridge was covered and of frame, and erected about 1850 by a chartered company. It was leased by the Philadelphia and Reading Railroad Company, whose track crossed it, connecting the main line with the Germantown and Norristown branch. The structure also included a carriage and footway.

The toll-house at the north end was ignited, and despite the efforts of the firemen was consumed.

The burning of the bridge will seriously interfere with the business of the Reading Railroad Company. The passenger trains running into Ninth and Green streets from the main line crossed this bridge, and it was used extensively for shifting between Norristown and Bridgeport.

Perhaps the bridge authorities have now come to the conclusion that they were not so economical as they supposed when they ordered the lighting of the structure with gasoline. We figure it that they are out of pocket about $41,000 through their niggardly parsimoniousness.

Loiseau Fuel Works Destroyed by Fire.—The Loiseau Fuel Works, at Port Richmond, were totally destroyed by fire on the afternoon of the 8th of March. The buildings were owned by the Philadelphia and Reading Railroad Company. The value of the machinery destroyed will aggregate $40,000, or more.

High-Priced Electric Lighting.—The New York *Sun* contains the following:

The whole problem of electric lighting having been reduced to the question of cost, all reliable calculations based on actual results must be welcome. On the 1st of January, 1882, a large railway station in California was lighted by a local branch of the Brush Electric Light Company. The dynamo was made to furnish forty lights, and worked by a fifty-horse power engine. Everything was made of the best material, and put up by experienced workmen. Allowing six months to pass so as to permit the expenses to be cut down to a minimum, and the employees to be trained to the best efficiency, calculations were made for the months of June, July, August, and September, 1882, with the following result:

Average cost per month	$525.52
Average cost per night	17.06
Average number of lights nightly	30.09
Average hours of lighting nightly	5
Average cost of one light nightly	55 cents
Average cost per light per hour	11 cents

Mr. Samuel Purnell, who makes this report, comes to the following conclusion. He states that the local opinion was that while the station was brilliantly illuminated by electricity, and better than gas could possibly do it, yet that sufficient light could have been obtained from gas for half the money.

Gas Trust (Philadelphia, Pa.) Employees.—In compliance with a resolution of request from the Philadelphia Councils, President Gardener, of the Gas Trust, reported, on March 16, upon the number and distribution of the employees of the Trust. There is a grand total of 1,697, apportioned as follows:

Seventh street office, 161; distribution department, 268; Spring Garden office, 64; Manayunk office, 6; Germantown office, 8; Frankford office, 9; Diamond street holders, 6; Mifflin street holders, 6; Germantown holders, 3; Bridesburg holders, 2; department of distribution, Germantown, 5; department of distribution, Frankford, 2; Ninth ward works, 476; Fifteenth ward works, 106; Twenty-first ward works, 40; Twenty-fifth ward works, 172; Twenty-sixth ward works, 363.

A Temporary Injunction Refused.—Judge Adams recently listened to arguments of counsel on the application of Adam Wackman for an injunction to restrain the St. Louis Gas, Fuel and Power Furnishing Company from further proceeding with the manufacture of gas at its works on Eighteenth street and Clark avenue, St. Louis, Mo. Mr. R. S. McDonald appeared for the plaintiff and Dyer and Ellis for the defendant. When the arguments had been submitted, Judge Adams declined to grant a temporary injunction, and the proceedings went over to take their regular turn.

Correspondence

[The Journal is not responsible for the opinions expressed by correspondents.]

A Pertinent Suggestion.

To the Editor American Gas Light Journal:

New York, March 26, 1883.

The death of an old lady, Mrs. Hannah C. Johnson, at 215 Graham street, Brooklyn, happening so soon after the introduction of water gas in the district supplied by the Peoples' Company, has rather exercised the monopolists connected with the Fulton Municipal Company; and they are making very strenuous efforts to prove that the gas made by them is not poisonous. That they are sorely tried in their efforts to do this, it is only necessary to say that the following opinion from Professor Chandler, in 1881, has to be republished in the Brooklyn papers.

Report of Professor C. F. Chandler, President of the Board of Health, to the Board of Aldermen, city of New York.

The President laid before the Board the following communication from the Board of Health:

Health Department,
New York, April 15, 1881.

To the Honorable Board of Aldermen:

At a meeting of the Board of Health, held on the 13th inst., the following report of the President was unanimously adopted, and a copy was ordered to be forwarded to your Honorable Body:

REPORT.

I have the honor to report that the petition of citizens referred to the Board of Health by the Honorable Board of Aldermen, with regard to the illuminating gas which is manufactured from steam, anthracite coal and naphtha, the so-called "water-gas," has been duly considered.

This gas has been extensively used in the city of New York for some years in public and private buildings. While it differs somewhat in composition from the gas manufactured from bituminous coal, it involves in its careless use the same sources of danger; if allowed to escape into the air without being burned it produces an explosive mixture with the air, and it is also liable to suffocate persons who may remain for any length of time in the atmosphere thus contaminated. *There are no facts which give any substantial foundation for the apprehensions of the petitioners that this gas is in any way more dangerous than the gas previously in use.* I would further state that the allegation that this "water gas" has been prohibited in Paris is directly denied by Professor Adolph Wurtz, of that city, in a letter which I have before me; that the greater density of the gas causes it to escape more slowly from leaks than does ordinary coal gas, and that its odor is so decided that leaks are detected just as readily as in the case of other gas. In conclusion, I would say I see no reason why official action should be taken on this subject. C. F. Chandler, President.

Which was referred to the Committee on Police and Health Department.

How very valuable the above opinion is, is very readily demonstrated by the great number of suffocations and deaths that have occurred from water gas in this city and Brooklyn, since its introduction in the two places.

In your issue of the 16th of March, you say, "That no amount of explanation can bring back to life those who have already died from the effects of the poison." That certainly is an established fact; but is there no redress for the relatives of those who have thus suffered? The limit fixed in New York State for a death caused by others is, as I believe, $5,000. One hundred deaths at this rate would be $500,000. In some States there is no limit to the amount of money that can be collected for causing death, and $25,000 or $50,000 might be collected in each case, where death occurs.

Wherever water gas has been introduced, either in this or any other country, cases of suffocation and death have very soon followed; and it is patent to all who wish to inform themselves of this great truth.

Now as the dead cannot be raised, would it not be well to make the effort for damages in each and every case; and see if, by affecting their pockets, it would not induce them to rid the gas they are distributing of the deadly carbonic oxide, which forms so large a part of all water gas, and is so potent in the causing of death to all who inhale it? E. S.

Poughkeepsie Street Lamps.—Chairman Cunley Corrects Mr. Allen.

Poughkeepsie, N. Y., March 26, 1883.

To the Editor American Gas Light Journal:

I have just read a communication in your Journal from A. L. Allen, in which he states that I personally knew nothing as to the charges made. I will now say that that statement is not as Mr. Allen represents it. What I reported I got from my own observation; and the whole Board, including the Mayor, received and adopted my report. One other item in Mr. Allen's communication I will also deny—that in reference to his quarter's pay. I reported a number of gas lights as not burning, for the quarter, to the amount of $66. This sum was deducted from his bill. I also offered a resolution at our last Board meeting directing the city attorney to give his opinion as to the validity of the contract said to be existing between the city of Poughkeepsie and the Citizens' Gas Company. We claim that the numerous violations of Mr. Allen, and his company, have invalidated it. There have been complaints made to me every week, since I have been chairman of the Lamp Committee, concerning the way and manner in which the streets lamps have been lighted this winter.

You will probably hear from Mr. Allen again. You certainly will hear from me if it should be necessary to reply to any more wild statements of Mr. Allen. Yours, etc.,

C. B. Cunley, Chairman Lamp Committee.

Gas Stocks.

Quotations by Geo. W. Close, Broker and Dealer in Gas Stocks.

(with W. R. Scott & Co.,)

34 Pine Street, New York City

March 16, 1883.

☞ All communciations will receive particular attention

☞ The following quotations are based on the par value of $100 per share.

	Capital.	Par.	Bid.	Asked
Gas Co.'s of N. Y. City.				
Central	$466,000	50	80	90
Harlem	1,800,000	50	97	99
" Bonds	170,000		—	—
Manhattan	4,000,000	50	233	237
Metropolitan	2,500,000	100	188	192
" Bonds	658,000	..	106	108
Mutual	3.500,000	100	115	120
" Bonds	3,000,000		100	102
Municipal	1,500,000	100	188	190
" Bonds	750,000		106	110
New York	4,000,000	100	124	126
Northern	125 000	50	—	95
" Scrip	108,000			
Gas Co's of Brooklyn.				
Brooklyn	2.000,000	25	115	117
Citizens	1,200,000	20	74	77
" S. F. Bonds	320.000	1000	105	107
Fulton Municipal	1 500.000	100	70	80
Peoples	1,000,000	10	53	55
" Bonds	290,000	.	104	107
" "	250,000	...	88	90
Metropolitan	1,000,000	100	78	85
Nassau	1,000,000	25	59	—
" Ctfs.	700,000	1000	90	93
Williamsburgh	1,000,000	50	70	75
" Bonds	1,000,000	...	100	101
Richmond Co., S. I.	300,000	50	70	75
" Bonds	40,000	—	—	—

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In good order. Have been but little used.

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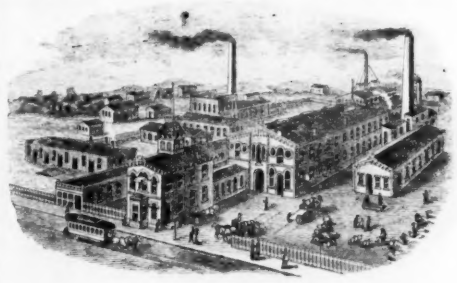

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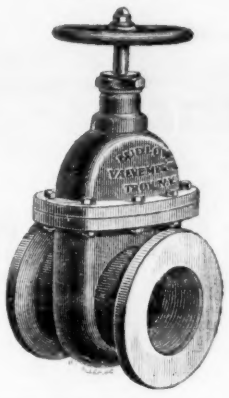

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Established in 1873.

Situated at Ellerslie Station, Md., on Balt. & O. R. R; also on Bedford Branch of P. R. R. Has convenient shipping arrangements on both roads. Works consist of two independent plants of machinery, so constructed and arranged that they can be run separately or together. One of the buildings entirely new, erected last year. Capacity of Works, over 14,000 bricks per day. Mount Savage Clay in abundance, mined on royalty, and delivered direct into Works by gravity. Inclined plane and tram road, large portion of which was laid with new T-rail last year. New artesian well, capacity over 35 barrels per hour; also mountain stream delivering water by gravity into tanks at Works. Seven acres of land, with 9 good tenements. Everything in first-class order for manufacturing and shipping brick direct from kilns into cars. Good and growing trade established. Brick unquestionably as good as the best made of Mount Savage clay. Statements of business done will be shown to responsible parties desirous of purchasing. Our good will and influence to go with sale. Any further information desired will be cheerfully given by Gardner Bros., Lockport, Pa.

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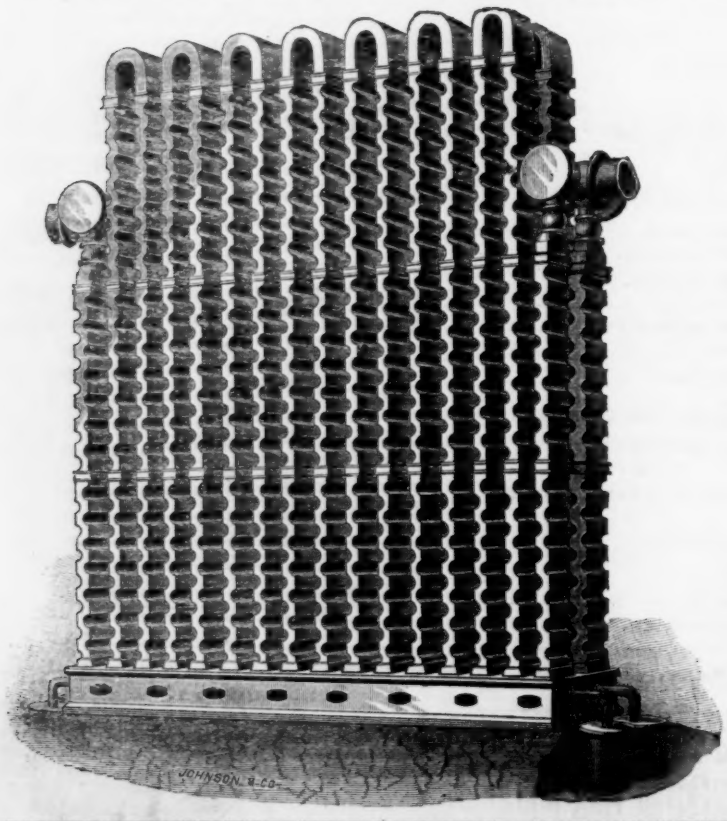

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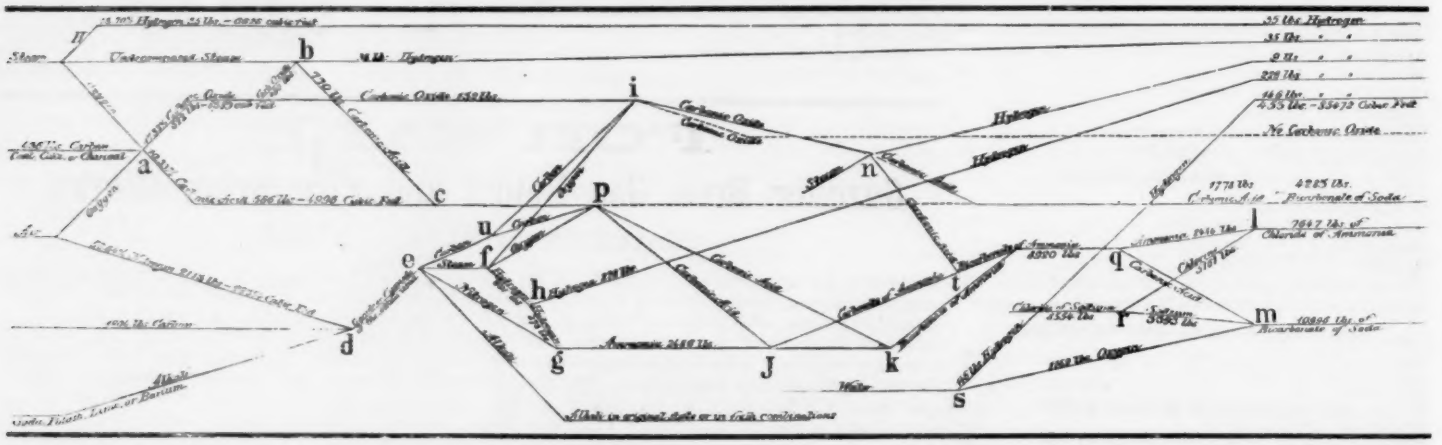

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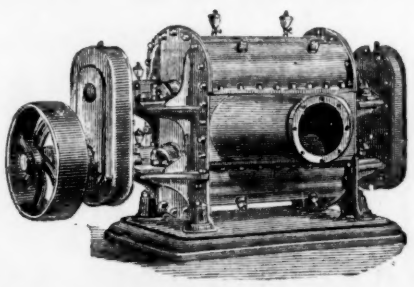

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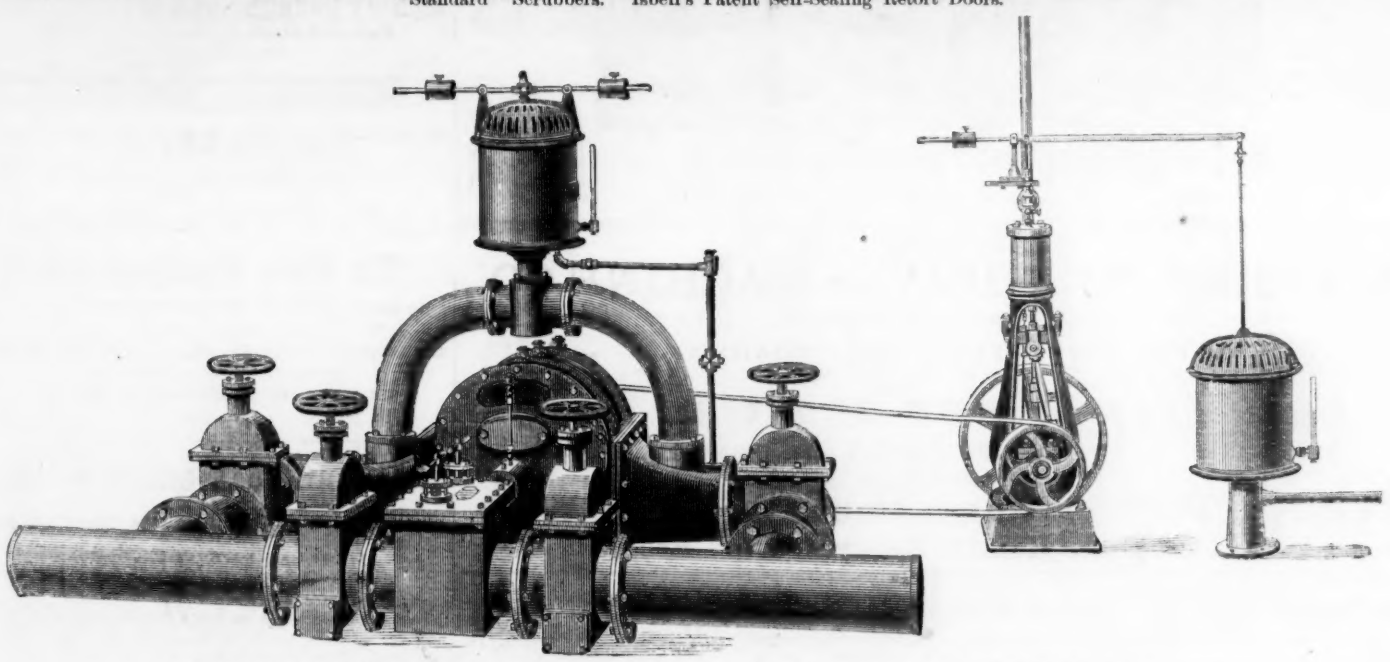

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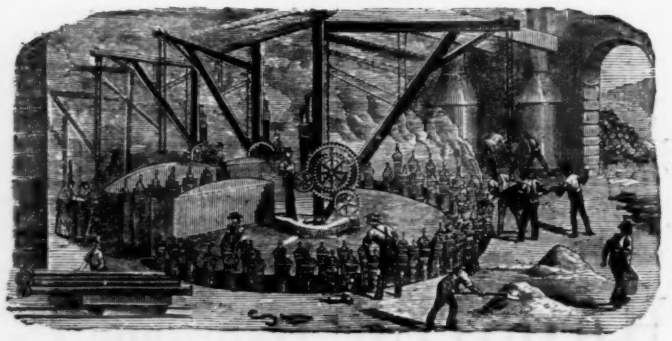

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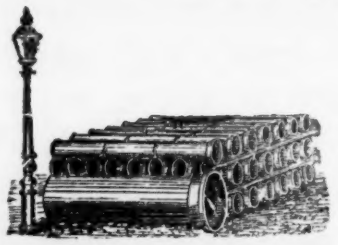

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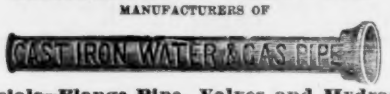

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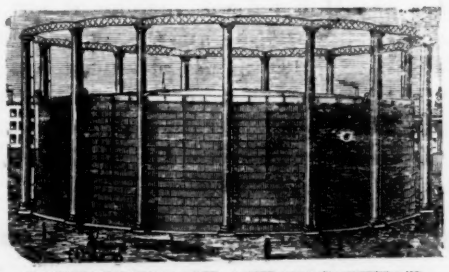

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Gas Light Companies are cordially invited to visit Yonkers and inspect this new system, which, if electricity *should* eventually drive them out of the field of illumination, will open to them another field still more vast and fruitful, and from which they never can be dispossessed. The Westchester Gas Light Company of the city of Yonkers employes the Lowe Process for making its gas. Here, then, can be seen, side by side in business competition, the Strong and the Lowe against the Motay and the old coal gas methods, and each observer will be enabled to form his own opinion as to their relative power and value. The STRONG GAS FUEL AND LIGHT COMPANY is the proprietor for the State of New York of the Strong Patents, five in number, and of the Lowe Patents, two in number. All applications for licenses or for information should be addressed, as above, to

R. W. VAN PELT, *President of the Company,*
And also President of the Yonkers Fuel Gas Co., and of the Westchester Gas Light Co.

THE GAS ANALYST'S MANUAL.

BY F. W. HARTLEY, A.I.C.E., M.S.E. **E. & F. N. SPON, PUBLISHERS.**

PRICE, $2.50.

A. M. Callender & Co., 42 Pine Street, N. Y.

INTERNATIONAL--1876--EXHIBITION.

The U. S. Centennial Commission

HAVE DECREED AN AWARD TO

HARRIS, GRIFFIN & CO.,

12th and Brown Sts., Philadelphia, and 49 Dey St., N. Y., U. S, A.,

FOR THE FOLLOWING REASONS:

The Exhibit consists of a Series of METERS from the Largest Size Station Meters for the use of the MANUFACTURE OF GAS, to those for the use of the ORDINARY CONSUMER. The Instruments are WELL MADE, RELIABLE as to INDICATION, and embody a number of sundry improvements which, with the general character of the Exhibit, entitle the whole to commendation.

Attest—J. L. CAMPBELL, Secretary, pro-tem. Signed—A. T. GOSHORN, Director General J. R. HAWLEY, President

CHARLES E. DICKEY. JAMES B. SMALLWOOD. CHARLES H. DICKEY.

Maryland Meter and Manufacturing Co.,

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Nos. 22 and 24 Saratoga Street, Baltimore, Md.

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DRY GAS METERS, STATION METERS, GLAZED METERS, TEST METERS, METER PROVERS, PRESSURE AND VACUUM REGISTERS, GOVERNORS, INDICATORS, SERVICE AND METER COCKS.

Meter Connections, Patent Car Fare Registers, Church and Tower Clocks with or without Illuminating Dials, and other light Machinery.

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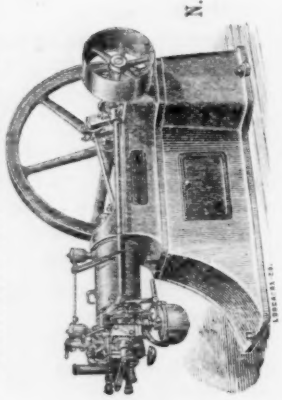

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THE "OTTO" SILENT GAS ENGINE,

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Having made simple and reliable improvements, we can now offer the supply engines from 1 to 12 horse power without

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PRACTICAL GAS METER MANUFACTURERS,

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MANUFACTURERS OF GAS STOVES FOR COOKING AND HEATING PURPOSES.

Dry and Wet GAS METERS, Station Meters (Square, Cylindrical or in Staves) Glazed Meters, King's and Sugg's Experimental Meters, Lamp Post Meters, Etc., Etc., Meter Provers (sizes 2, 5 and 10 feet), Pressure Guages of all kinds, Pressure Registers, Pressure and Vacuum Registers, Pressure Indicators (sizes 4 inch, 6 inch and 9 inch), King's Pressure and Vacuum Gauges, Dry and Wet Centre Seals, Dry and Wet Governors, Exhauster Governors, Photometers of all descriptions. Letheby's Sulphur and Ammonia Test Apparatus complete—also Testing and Chemical Apparatus of all kinds, and of the most perfect description, for all purposes relating to Gas.

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We use only the very best materials, and employ the most skilled labor, and by our long experience (29 years) and personal supervision of every detail, we feel justified in assuring the public that our goods will give perfect satisfaction. Every Meter emanating from our establishment will bear the State Inspector's Badge, and will be fully warranted by us. Our Annual and Calendar will be sent to Gas Companies upon application.

Cathel's Gas Consumer's Manual.

Enables every Gas Consumer to ascertain at a glance without any previous knowledge of the Gas Meter, the quantity and money value of the Gas consumed. Also the best method of obtaining from Gas the largest amount of its light.

It will be to the advantage of Gas Companies to supply their Consumers with one of these Guides, as a means of preventing complaints arising from their want of knowledge in regard to the registration of their meters. For sale by

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FODELL'S System of Bookkeeping

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Price $5, which should be sent either in Check P. O. Ord or Registered Letter.

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BRAY'S PATENT LANTERN.

SOLE AGENTS IN AMERICA FOR

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PATENT FLAT-FLAME BURNERS

AND

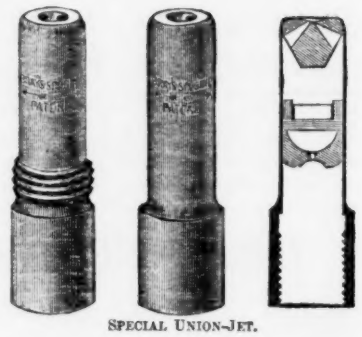
BRAY'S

Patent Lanterns

Bray's Patent Standard Slit-Union Burners do not Corrode in any Atmosphere.

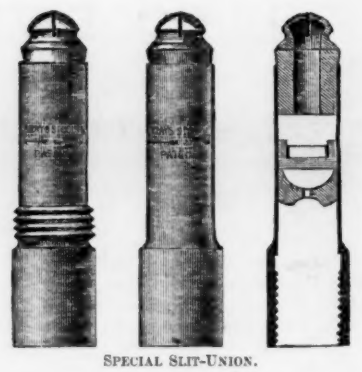
STANDARD SLIT-UNION.

They give a Permanently Well-shaped Flame, free from Roaring and Flickering.



SPECIAL UNION-JET.

The Special Burners are made for both High and Low Pressure. In ordering Burners our customers will confer a favor by stating the Pressure.



SPECIAL SLIT-UNION.

The "Special" Burners, as improved, are more adaptable to the requirements of gas illumination than any now before the public. They can be made to suit any pressure or quality of gas (including air gas). The gas inlet is so placed that it cannot be tampered with, and they are not liable to get out of order.

The following table and sentences in quotation marks are taken from the report of S. C. Ford, the United States Inspector of Gas and Meters at Washington, D. C., for the year 1881:

Description of Burner.	Pressure at points of ignition.	Actual consumption of gas per hour.	Illuminating power in candles at rate of actual consumption.	Illuminating power in candles, at rate of 5 cu. ft. per hour.	Value of one foot of gas in terms of standard candles.
	Inches.	Cubic Feet.	Candles.	Candles.	Candles.
Bray's Standard Slit-Union (80 candles....	.255	6.80	30.04	21.76	4.35
" Special Slit-Union No. 7.....	.50	4.74	19.20	20.25	4.05
" " " No. 6.....	.50	4.10	16.61	20.25	4.05
" " " No. 5.....	.50	4.24	16.97	20.01	4.00
" " " No. 4.....	.60	3.49	12.58	18.02	3.60
" " Union Jet No. 7.....	.50	4.84	19.13	19.76	3.95
" " " No. 6.....	.55	4.32	17.10	19.79	3.95
" " " No. 5.....	.60	4.14	15.65	18.90	3.78
" " " No. 4.....	.55	3.38	12.04	17.81	3.56
" Regulator Union Jet No. 7.....	.50	4.99	17.69	17.72	3.54
" " " No. 6.....	.50	5.18	17.63	17.01	3.40
" " " No. 5.....	.60	4.87	13.71	15.68	3.13
" " " No. 4.....	.60	3.97	11.46	14.43	2.88

"On examination of the above table of tests, made with various burners, it will be observed that the illuminating power obtained with Bray's special burners Nos. 5, 6, and 7, both slit-union and jet form, was high; but with Bray's regulator burners only moderately good."

"The result of test with Bray's standard slit-union burner was highly satisfactory. This burner is best suited for street illumination, and will yield the maximum power obtainable from a cubic foot of gas."

"The special burners manufactured by Bray & Co. compare favorably with any yet inspected by this office. They are well made, and no doubt will prove very durable in practical use. They are best adapted for gases of high gravity."

Bray's Patent Standard Slit-Union Burners are of 30, 40, 50, 60, 70, and 80 candle power. The Patent Lanterns are adapted for burners of 50, 80, 100, 200, 300, 400, and 800 candle power, and are acknowledged to be the best lantern for street lighting yet invented. Price Lists and Circulars furnished on application.

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